

MODERN MachineShop

A MAGAZINE FOR MACHINE SHOP EXECUTIVES

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Editor.

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We are enthusiastic users of ARMSTRONG Tool Holders.

—B. R. ATKINSON
Morrison Machine Co.
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There are no characteristics more important to machine tools than general adaptability and absolute dependability. These are characteristics always found in ARMSTRONG Tool Holders. They are designed and proportioned on lines which our many years of experience as specialists in this field have shown to be correct, they are forged from special steel which combines stiffness and strength to an extreme degree and are accurately machined, heat treated and hardened. The set screws are made of treated alloy steel with hardened points and are practically unbreakable.

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Straight
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Stocks and Dies
Chain Pipe Tongs
Pipe Wrenches

Pipe Cutters
Chain Vises
Hinged Vises

Write today for
Catalog B-27

MODERN Machine Shop

NOVEMBER, 1929

CINCINNATI, OHIO

VOL. 2, No. 6

"A Lagging Job Makes No Profit"

By PHILIP WINTER

ONE of the best-equipped and most efficiently-operated tool and die shops in the country is the plant of the South Bend Tool and Die Company, South Bend, Indiana. This plant was intended to serve as a sort of auxiliary tool room to the metal-working manufacturing plants in Northern Indiana and South Michigan—and it is kept busy.

Many of the large plants in the territory mentioned are confronted, from time to time, with the necessity of turning out an extraordinary amount of tool work in order to take care of changes in design, increases

Here is a tool and die shop that owes its success—the manager says—to an iron-bound policy of "deliveries on schedule."

in production schedules, and so on. These sudden increases in pressure on the tool room of any one plant are not frequent, it is true, but they usually mean that either more skilled mechanics must be hired and more expensive

equipment purchased at once, or that the extra work must be "farmed out" to neighboring tool shops. It is usually more economical to follow the latter plan, and that is where the South Bend Tool and Die Company comes in.

The shop is located in an important manufacturing locality, containing a number of large and growing manu-





Fig. 1—A corner of the drafting room.

facturing plants. At the same time there has been a dearth of good tool shops in this district, which has forced the manufacturers to send their extra tool work to Detroit, Chicago, or other distant points. The inauguration of this shop has relieved this situation and the policies under which it operates have made it an asset to the community.

The most important of these policies, according to J. R. Huckins, Gen-

eral Manager, is that of fulfilling promises and turning out work according to schedule. The date upon which machinery can be set in motion to meet an increased schedule, or to produce parts for a new product, may be dependent upon the delivery of new jigs, dies, or fixtures. Therefore the manufacturer must know definitely when such

tools will be available, so as to be able to hire the necessary help and otherwise plan intelligently. Accordingly, Mr. Huckins has made a rule that nothing shall be allowed to stand in the way of "deliveries on schedule."

Speed is not the only factor in the success of the shop, however; quality is of just as great importance. Quality in tool and die work depends largely upon the efficiency of the



Fig. 2—View of one side of the shop.

eral Manager, is that of fulfilling promises and turning out work according to schedule. The date upon which machinery can be set in motion to meet an increased schedule, or to produce parts for a new product, may be dependent upon the delivery of new jigs, dies, or fixtures. Therefore the manufacturer must know definitely when such

Fig. 3— is hand crane s and ma Workin Fig. 5— & Mills

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equipment, and good equipment is not lacking here. If drawings are sent in by the customer, all well and good; if not, several thoroughly capable designers are available. A view of the drafting room is shown in Fig. 1. The tool and die designers are experienced mechanics who have developed into designers and are, therefore, familiar with both the practical and theoretical sides of designing.

The shop is laid out so that the benches—which are of the individual type—are next to the windows with the machinery and tool crib in the center of the room. There are fourteen benches on the left side of the room, as shown in Fig. 2, with three



Fig. 3—The heavier work is handled here. A five-ton crane serves both benches and machines. Fig. 4—Working on large dies. Fig. 5—A battery of Smith & Mills shapers.



high-grade tool room lathes aligned on the inner side of the aisle and the grinding department at the rear.

A number of Brown & Sharpe face plates, mounted on portable benches, as shown, are provided for the use of the bench mechanics. At the opposite

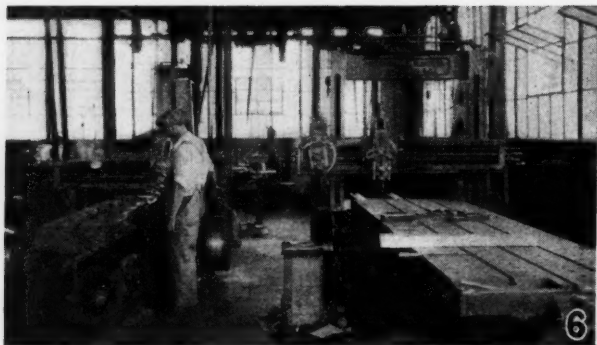


Fig. 6—These two planers provide for machining heavy work. Fig. 7—Two of the five milling machines.

side of the room, Fig. 3, is room for twenty-two benches. An overhead crane extends the length of the shop at this side to provide for handling heavy work back and forth to the machines, the heavier equipment being also located on this side of the shop. A view of some of the larger machine units is shown in Fig. 4.

A battery of Smith & Mills shapers, Fig. 5, provides for surface machining on small work. Pieces that are too cumbersome to handle in the shaper are machined in one of the planers shown in Fig. 6. The large Cincinnati planer will handle anything that can be finished with the rest of the equipment, and the openside planer will handle odd-shaped work.

Two of the five Brown & Sharpe milling machines are shown in Fig. 7. Four are of the horizontal type and the fifth—shown in this illustration—is vertical. A Pratt & Whitney 6-inch vertical shaper is shown in Fig. 8, where a mechanic can be seen slot-



ting a section out of a piercing, cutting off and notching die. The mechanic shown in Fig. 9 is using a Pratt & Whitney jigsawing machine to bore the holes in a jig for a metal radio cabinet. There are 106 holes in this die—all of which must be bored to size and

be accurately spaced within a fraction of a thousandth of an inch. The boring tool is held in a Flynn boring head, which provides for the necessary fine adjustment of the tool. The set of end-measures and inside micrometers that is provided with this machine, together with the dial indicators which are built in, as shown, have eliminated the necessity for using "buttons" in setting up tool work for machining.

Irregular surfaces on small dies and templates are sawed out and filed to size with the aid of the machine shown in use in Fig. 10. A solid section can be sawed out to within a small fraction of an inch of the finish line, then the saw can be replaced by any one of a number of files and the piece finished to the exact dimension



"This machine is a
fine looking job, both
from the standpoint
of design and work-
manship. We are very
much pleased with
the machine, your
service and treat-
ment. . . ."

Yours very truly,
ATLAS IMPERIAL
DIESEL ENGINE
COMPANY
G. H. Wallace,
Works Manager.

Another Heavy Duty Micro To A Diesel Engine Builder

THE above photograph shows a Model "J. G." Heavy Duty Micro, Grinder recently installed in the plant of the Atlas Imperial Diesel Engine Company, Oakland, California. That this company is well pleased with its new MICRO is indicated by the above excerpt from a letter received from Mr. G. H. Wallace, Works Manager.

Diesel engine builders are increasingly large users of Micro Internal Grinders. The extreme rigidity of the machine—the tapered grinding spindle which eliminates whipping—and the ease of accurate control are features which insure absolute *accuracy* and superior *finish* throughout the grinding range. For these reasons, Micro Grinders are the best available machines for grinding cylinder walls, wrist pin holes and other similar internal surfaces. There are any number of other production conditions where the *speed*, *accuracy* and *superior finish* that comes with grinding the "Micro Way" will prove equally advantageous.

There's a Micro Grinder for your special requirement. Write for complete details.



MICRO MACHINE COMPANY

MANUFACTURERS AND DESIGNERS OF

Bettendorf

PRECISION GRINDERS
FOR ALL PURPOSES

Iowa, U-S-A

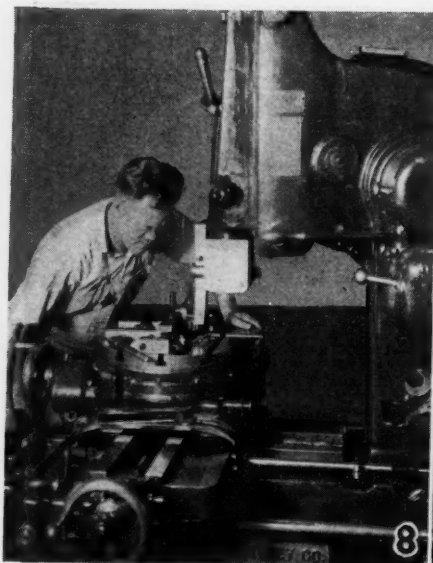


Fig. 8—Using a vertical shaper to slot a die.

required. A jet of air from a small compressor that is built into the machine keeps the dust away so that the operator can work to the line.

No shop of this type would be complete without a horizontal boring machine. Such a machine—accurate enough for fine operations and sturdy enough to handle heavy work—is shown in use in Fig. 11. The operation in process is that of rough boring the frame for a scroll bending machine, for which a single end boring bar is used. The finishing

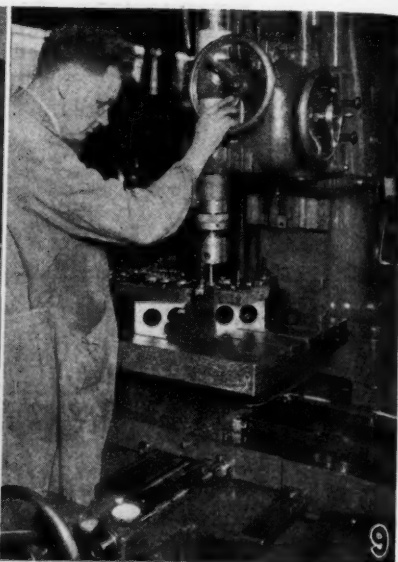


Fig. 9—Boring 106 holes in a jig for a radio cabinet, using a P. & W. jig-boring machine.

operation will be done with a bar that is piloted in the tailstock, assuring extreme accuracy.

Fig. 12 shows an interesting unit, composed of two toolmakers' bench lathes and two Canedy-Otto sensitive drilling machines. The drilling machines are each motor-

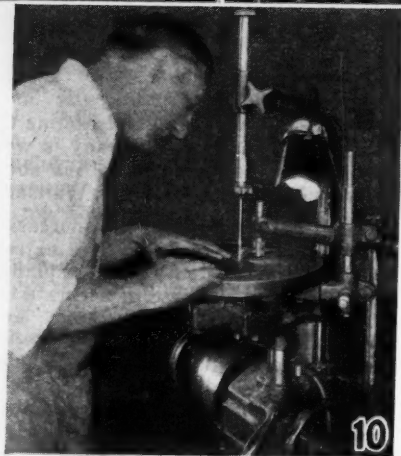


Fig. 10—This machine can be used either for sawing or filing.

driven, avoiding the possibility of vibration that might be caused by overhead belts. The grinding equipment is grouped to form a complete department, occupying a corner section. The equipment consists of a Brown &

MIN.
CENT
DIST
.2

IN
49

**MINIMUM
CENTER
DISTANCE**
.260"

**MAXIMUM
CHUCK
CAPACITY**
.400"



THE BOLEY MULTIPLE SPINDLE DRILLING AND TAPPING MACHINE was placed on the American Market **FOUR YEARS** ago.

Two types—10 and 13 spindle machines.

Hundreds of these machines are in use today.

Adjustable spindles can be set to any desired position. New or changed parts can be handled through this feature without expensive tool costs.

Feed operated by hand or foot lever.

Built by G. Boley—manufacturer of precision machinery for 60 years.

INDEX MACHINERY CORPORATION

49 CENTRAL AVE.

CINCINNATI, OHIO

(Represented by responsible dealers in all sections)

Sharpe cylindrical grinder, a B. & S. surface grinder, a Gallmeyer & Livingston surface grinder, a Diamond surface grinder, and an internal grinder.

Mr. Huckins says that, in bidding for work, he does not try to meet

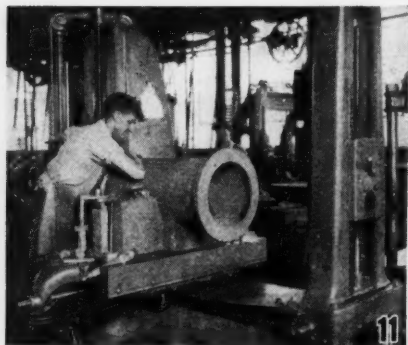


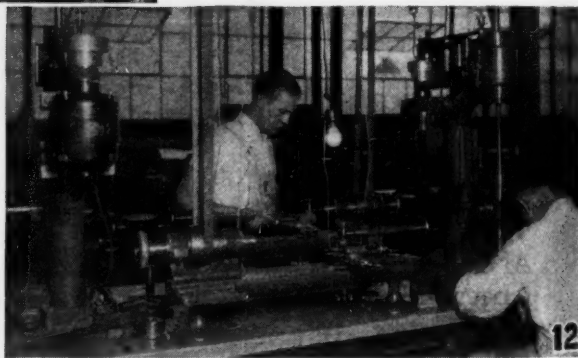
Fig. 11—Boring a frame for a scroll-bending machine. Fig. 12—These two Canedy-Otto drills and two bench lathes form a handy unit.

competition. Knowing that his workmen have the advantage of the best equipment obtainable, he gives his customers the lowest price commensurate with a fair profit, quality work, and prompt deliveries. The time factor is, however, taken into consideration, and many times a lower price can be made if a longer time is allowed for delivery. This is natural, as rush work involves overtime at an increased expense for labor and overhead.

Whatever the delivery date is, however, the first rule of the shop is that the job must go out on time. Adherence to this rule is required, not

only for the customer's sake, but because, as Mr. Huckins says, "A lagging job makes no profit." In other words, a job that is turned out on schedule is usually found to make the amount of profit intended when it was accepted, whereas a job that is found lagging behind and which is finished after the time promised will usually be found to be profitless when the final accounting is made.

Mr. Huckins says that those of their customers who give them work on a time and material basis are usually ahead. When figuring on a contract basis, a certain amount has to be added to the price to allow for possible troubles—and the troubles may never happen. In this case, of course, the firm makes a good profit. If the job is taken on a time and



material basis, the customer will often make a good saving and the South Bend Tool and Die Company is satisfied with a reasonable percentage for profit. Realizing that "customer confidence" is the firm's greatest asset, every effort is made to build up this confidence, and no more is charged for a job than it is worth.

Mention MODERN MACHINE SHOP when writing advertisers.

POWER

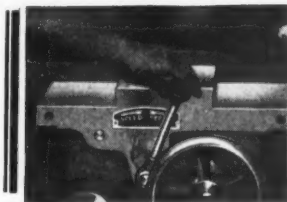
FEED and SPEED CHANGES FROM FRONT OR REAR.

WITH the introduction of this new and simplified method for changing speeds and feeds by power from the front or rear—operating convenience takes on a new meaning. On the new No. 3 Cincinnati Millers you instantly obtain with ease the right speed or feed without moving from the normal operating position either at the front or rear. It is so easy that your operator keeps your machine in high at all times. He does the job in less time and obtains a higher quality of milled surface.

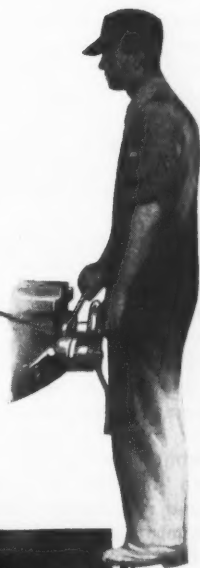
Toolroom and manufacturing shops alike, demand milling machines with a new accuracy and a new convenience. Where else but on the new No. 3 Cincinnati Millers can you find this combination of accuracy and convenience?

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI, OHIO, U. S. A.



Close up of the speed and feed change lever located at the front of the knee.



Coarse tooth spiral mill set-up with under-slung tooth rest. Tooth rest is carried on stationary wheel head. Wheel pressure keeps tooth against blade.



DD represents periphery of grinding wheel, BB circumference of cutter, AA desired clearance as obtained with cup wheel on Ohio Grinder, CC clearance angle obtained using periphery of grinding wheel for clearance.



More Cutting —Less Grinding

With Solid-Backed Cutting Edge

ON THE Oesterlein Grinder, a cup-shaped wheel grinds a straight-line clearance that results in a solid-backed cutting edge. This type of edge lasts much longer than any hollow ground one.

The advantages of a solid-backed cutting edge? It stands up longer and results in less time out for maintenance, increased output,

reduced cost of production. These savings characterize the Oesterlein Grinder and soon pay for the machine.

The sketch above shows the right and wrong way of grinding cutters. The photograph indicates correct set-up on an Oesterlein Grinder for grinding coarse tooth spiral mills in a way that means more cutting and less grinding.

Write for booklet E—a treatise on correct grinding of metal-cutting tools.

THE OESTERLEIN MACHINE CO., Cincinnati, Ohio

OESTERLEIN
OHIO
MILLING
GRINDING DRILLING
EQUIPMENT

SUGGESTION PLAN

The purpose of this system is to promote interest in better methods and conditions, and suggestions along the following lines are desired:

Development of new products	Increase in production
Improvement in quality of products	Improvement of present methods
Improvement in safety appliances	Elimination of unnecessary work
Reduction of cost of products	Increase in sales of our products
Reduction of waste	

AWARDS

\$ 5.00 for each accepted suggestion	\$100.00 for the best suggestion received annually.
\$100.00 for the largest number of suggestions accepted annually.	\$ 50.00 for the second best suggestion received annually.
\$ 50.00 for the second largest number of suggestions accepted annually.	\$100.00 for any suggestion on which patent is obtained and assigned to Bird & Son, Inc.
\$ 25.00 for the third largest number of suggestions accepted annually.	

RULES

Any number of suggestions may be submitted by an employee at any time.

Each suggestion should be on a separate sheet, using the regular suggestion blank.

Suggestions must be clearly and fully described, and a sketch should accompany the suggestion whenever possible.

The suggestions should be deposited in a Suggestion Box or mailed to the Secretary of the Suggestion Committee.

Suggestions should come from all

departments: Offices, Sales and Manufacturing.

Each suggestion is promptly acknowledged by the Suggestion Committee, and the result of the action taken is reported as soon as possible after each meeting.

Awards for accepted suggestions will be made to all employees of Bird & Son, Inc., except heads of departments, foremen, employees on development work, and members of the Suggestion and Executive Committee, whose duties it will be to review and make awards.

SUGGESTION COMMITTEE FOR EAST WALPOLE AND NORWOOD PLANTS

C. W. Conrad, Chairman		W. M. Smith, Secretary	
S. B. Montgomery	E. M. Lines	T. C. Henderson	H. N. Mann
S. W. Smith	R. M. Wright	E. L. Chamberlain	B. D. Rogers
	H. H. Miller	A. H. Anderson	

MEETINGS—First Wednesday of Each Month

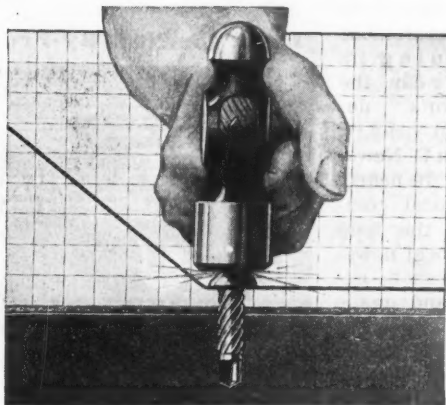
FINAL AWARD COMMITTEE

Charles S. Bird	Philip R. Allen	George R. Wyman
September 1, 1926		Bird & Son, Inc.

ELIMINATE TAPPING WITH THESE UNIQUE SCREWS



Hammer down metal assembly costs



...by hammering in this Screw that makes secure fastenings without tapping

When Hardened Metallic Drive Screws are adopted for an assembly, the costly, time-wasting items that make assembly costs climb are banished.

Tapping is eliminated. So are broken taps, tapping plates, tapping machinery maintenance, and stripped and crossed threads that result in scrapped parts and materials.

No need for skilled workmen, either. Any man can make permanent fastenings to iron, brass

and aluminum castings, steel, Bakelite, etc., with Hardened Metallic Drive Screws. Nothing could be easier, quicker or cheaper.

Just hammer the Screw into a drilled or molded hole. It cuts its own thread in the material and binds the sections so securely that the fastening holds under vibration and severe service.

20,000 manufacturers have tested and adopted these Screws. Try them—on your own work. Describe your assembly—we'll furnish samples, free.

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192-196 Varick Street New York, N. Y.

PARKER-KALON
TRADE MARK
HARDENED METALLIC
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DRIVE SCREWS

PAT. JAN. 29 1924-NO. 1482151-OTHERS PENDING

Parker-Kalon Corporation
192-196 Varick St., New York, N. Y.

Send me samples of Hardened Metallic Drive Screws. I want to try them for

Name
Address

House Organs: Where such company papers exist, a regular, featured "Suggestion Column" should be incorporated into its pages immediately. This "Column" should list the awards made, give a brief summary of the suggestion that merited the award and if possible a one or two-sentence statement regarding its value from the suggestor's department head.

Local Newspapers: In nearly every local community the help of the local newspapers can be enlisted and made to further the suggestion idea in a most helpful way. Editors of such newspapers regard the awards as real news and will often give the item sizeable space if all details are made known.

Bulletin Board: After the announcement of the plan it is highly profitable to bulletin the names of winners and the amounts awarded on these boards immediately after such awards have been made. Lists of this character, posted at more or less stated intervals, rapidly become a sort of "honor roll."

Pay Envelopes: Stuffers inserted in pay envelopes are resultful as a means to the general end of keeping the system ever before the personnel. Employers who have used envelope stuffers for one purpose or another are frequently discouraged to find so many of the slips almost immediately discarded by the men. It should be

remembered, however, that pay envelope stuffers have nothing to sell but an idea—that there is little or no reason for the worker to keep the slips indefinitely. And after all, a direct mail advertising piece that pulls a 10 per cent return would be considered most resultful.

Personal Letters: Any letter from the president or general manager to an employee will get attention 100 per cent of the time. Men who have advanced ideas, only to have them rejected (however good the reason) are frequently slow to try again. It is recommended that the controlling executive of every system write such men personal letters after an interval of thirty days,

providing no second suggestion has been made in the meantime. Such letters will iron out misunderstandings and stimulate interest and endeavor as few other things will. Checking the list of suggestors against the pay-roll will give the management a list of their non-suggestors. This list can and should be circularized by personal letters.

Short Talks: When awards have been made it is frequently well for an official of the company to call the workmen together and give them a ten-minute talk on the subject of suggestions. Names of men receiving awards, the total amount of money expended in awards, names of depart-

Ideas for New By-Products

Paints: Paints, brushes, paint rollers, paper and putty, varnishes, etc. are all by-products from the hog.

Oil: Fertilizer, "hot dog" casing, grease, drum, binder, and many other products come from tallow.

Paper: Paper, soap, and smaller are other by-products for the meat packer.

Glass: Glass, hair pins, combs and pipe stems are made from the bones of the hog.

Can you think of a by-product which we can make from our waste material?

Football, fertilizers, artificial silk, paint brushes, handbags, massage skins and many other items are by-products of pigs. Vaseline is a by-product of petroleum. Flower barrels are by-products of sawy chains. Match blocks are by-products of planing mills. Can you think of by-products that we could make?

One idea may be worth a great deal

VAN NORMAN DUPLIX MILLERS



cover the widest range of Experimental, Research, Die, Tool, Fixture, Gauge, and Metal Pattern Work.

The Pivotally Adjustable Cutter Head—Mounted on

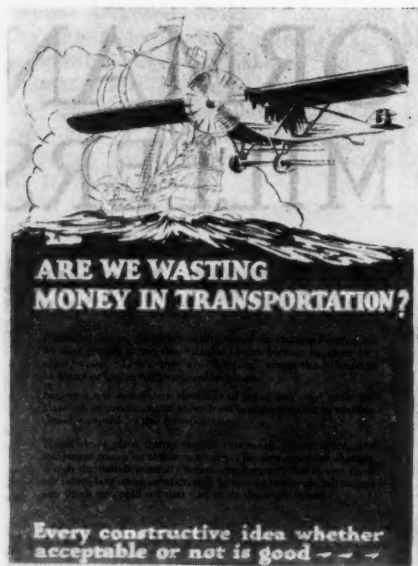
the Horizontally Slidable Ram (two exclusive Van Norman features) puts the Van Norman in a class by itself.

Van Norman Machine Tool Co.

150-200 Wilbraham Avenue

SPRINGFIELD

MASSACHUSETTS



ments giving the largest number of acceptable suggestions, the mutual value of ideas—are, in themselves, hints for the text of such short talks. There is one prerequisite which must not be overlooked—the talk must be short.

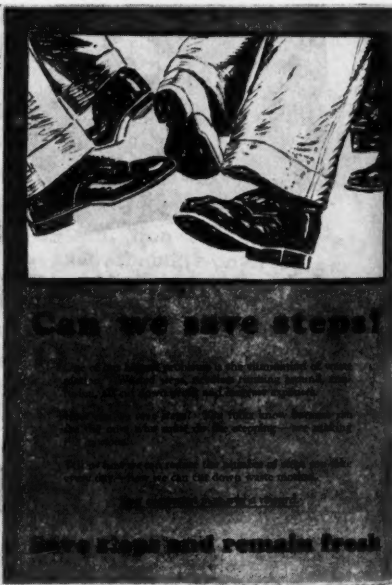
Competitive Contests: Staging a contest between departments, sections, buildings, etc., is a most effective means for stimulation and keeping alive interest in the system. Publicity is invaluable—but publicity and competition is a combination hard to beat.

Too much cannot be said of the need for prompt acknowledgment to every suggestion. A suggestion of any kind indicates thought and at least superficial analysis on the part of the suggestor. Frequently this thought has extended over a period of days, even when the suggestion is most minor in character. To delay the acknowledgment of such a suggestion is frequently interpreted by the worker (privately, of course), as

a reflection upon his effort, and he secretly vows that this suggestion will be his last—as frequently it is.

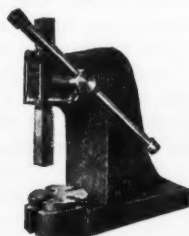
No suggestion should remain unacknowledged longer than twenty-four hours, and his elementary necessity presupposes the need for a competent record clerk. The person selected must be intelligent enough to recognize the need for prompt acknowledgment, to accurately re-type the original suggestion to the record cards for use by the committee members, to keep secret the identity of the suggestor, assign a serial number to the duplicates, properly enter the cross-index record, and perform clerical work in conjunction therewith.

In any plan having to do with industrial relations, seemingly inconsequential details are frequently of great importance. Ordinarily the record clerk is assigned the duty of making the rounds of boxes and collecting the suggestions. While this





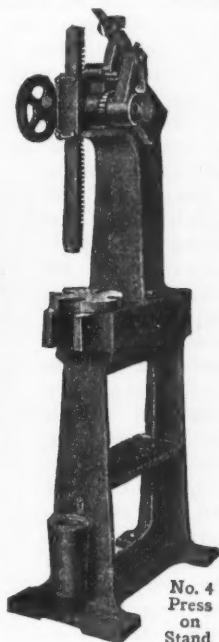
No. 1 Press



No. 2 Press



No. 3 Press

No. 4
Press
on
Stand

SHELDON Arbor Presses

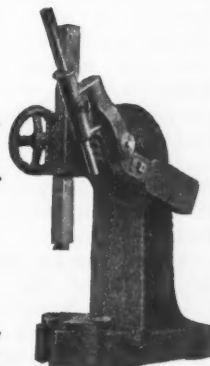
DESCRIPTION—Sheldon Arbor Press frames are made of semi-steel, the metal being properly distributed, giving a light and exceptionally strong casting. Rams and pinions are made of alloy steel, heat-treated. Large stub tooth is used. Rams are square, carefully fitted, insuring proper alignment.

Nos. 1 and 2 presses are furnished only with plain levers. No. 3 presses are furnished either plain or ratchet levers. No. 4 presses only with compound levers.

Floor Stands can be furnished for our No. 3 and No. 4 presses. They are made of semi-steel, are well ribbed and of heavy construction. They are provided with removable shelves and wood pots for catching mandrels, tools, etc.

— SPECIFICATIONS AND PRICES —

Ask for Complete Catalogue	No. 1 Press	No. 2 Press	No. 3P Press	No. 3R Press	No. 4 Press	No. 3 Floor Stand	No. 4 Floor Stand
Largest dia. will take.	7"	12"	16"	16"	20"		
Largest dia. mandrel..	1"	1 1/4"	2 1/4"	2 1/4"	3"		
Height over plate....	4 1/2"	8 1/2"	14"	14"	18 1/4"		
Max. height will take.	5"	9 1/2"	15"	15"	19 1/2"		
Size of ram (square)..	7 3/8"	1 1/2"	1 1/2"	1 1/2"	1 1/2"		
Length of ram.....	7 3/8"	13 1/2"	21"	21"	26"		
Movement of ram....	5"	9 1/4"	15"	15"	20"		
Leverage.....	25 to 1	35 to 1	48 to 1	72 to 1	100 to 1		
Pressure on ram (tons)	3/4	2	5	7 1/2	10		
Height.....	9 1/2"	17"	26"	26"	33 1/2"	35"	30"
Dimensions of base...	4"x10"	6 1/4"x17"	8"x20"	8"x20"	8"x24"	14"x22"	14"x25"
Net weight.....	19 lbs.	75 lbs	150 lbs.	215 lbs.	320 lbs.	145 lbs.	185 lbs.
Weight crated.....	20 lbs.	85 lbs.	170 lbs.	240 lbs.	360 lbs.	150 lbs.	195 lbs.
Price, F.O.B. Chicago.	\$10.00	\$20.00	\$30.00	\$40.00	\$75.00	\$20.00	\$30.00



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practice can be followed the majority of the time, none the less, the psychological effect on the workmen of seeing the president, the vice president or the general manager personally collecting the suggestions is very beneficial to sustained interest in the system.

Because of the necessity for prompt acknowledgment, all boxes should be emptied once a week, at the time the new posters are displayed. The collection schedule should be given in the announcement of the plan, then reiterated at infrequent intervals in the company paper or on the bulletin boards.

Committee meetings, for the average plant, should be held twice a month, although once a month in certain plants has been found entirely satisfactory. All suggestions on hand should be disposed of at each meeting, since "hangovers" usually result in unexplainable delay and dissatisfaction.

Award checks should be made out and sent to the suggestor within twenty-four hours after the award decision has been made. This, because in all probability the suggestion is then from one week to three weeks old, and the suggestor may be wondering as to the status of his suggestion.

While it is necessary that the suggestor's name be known to someone (the record clerk in the majority of

cases and then only for purpose of identification), it is highly essential, particularly in large organizations, that secrecy be a feature of every system.

In the minds of many employees will be found the suspicion, if not conviction, that personal prejudice or "pull" will influence the Suggestion Committee in passing upon a suggestion or arriving at an award. However warranted or unwarranted such a suspicion may be, it will lurk in the minds of some employees in every organization, and although perhaps never audibly expressed, it will militate against the success of the system. The strict maintenance of secrecy is the

only way to effectually eliminate all possibility of suspicion in this regard.

There are several ways of preserving this secrecy. One is to provide the suggestion blanks with a stub which may be detached and retained by the suggestor, who is later identi-

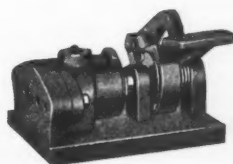
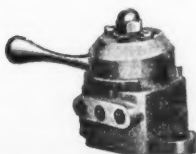
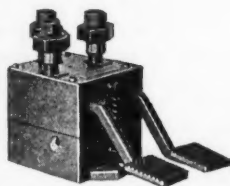
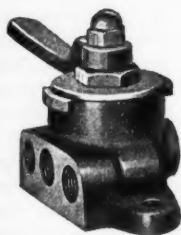
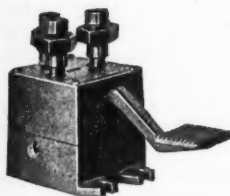


{ Much of the material given in this and previous articles was taken from the author's book on Suggestion Systems, copyrighted by Morton. All posters reproduced here also copyrighted by Morton. }

fied by his possession of the stub. This practice makes necessary the use of a more expensive suggestion blank and the numbering serially of both blank and stub. It has the further result that the word of an employee

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must be taken on a matter that may involve two or three men.

Since the original suggestions must be copied for the use of the committee members anyway, the better plan is to require the signature of the suggestor to every suggestion, which is sealed in an envelope before it is dropped into the box. This method places a definite means of identification in the clerk's possession, and provides for the refusal of anonymous suggestions.

Provide workers with suggestion blanks and envelopes. Require their signature to each suggestion, but assure them their identity will be known only to the clerk in charge.

One of the most important factors in the operation of a successful suggestion system is the employment of some means for stimulating ideas—for directing the thought of the workmen. This is best accomplished by the employment of periodic posters—each poster to ask for suggestions along a single line. For instance, in one period of two weeks, or one week, or even a month, ask for suggestions on ways and means for eliminating fire hazards. Following that period, ask for ideas on how to reduce waste. Other posters or bulletins to follow successively might ask for ideas on power transmission, safety, economy, accuracy, ventilation, plant lighting, and so on. In this way you direct the suggestion thought of your employees, stimulate constructive thinking, compel attention to hitherto unnoticed factors, put your employees (mentally) in the position of manager, and vastly increase the number of constructive suggestions.

Miracles rarely happen—and almost never in connection with a suggestion system. Literally hundreds of shop managers have, at one time or another, set up a "suggestion box," followed it with an improperly pre-

pared plan, then after the announcement—which had been accompanied by enthusiasm, and high hopes, witnessed the goodly number of suggestions dwindle to a few or none at all and the subsequent death of the plan, usually without proper burial.

If your suggestion system is to be made to work continuously and the suggestion boxes are to collect something besides dust, it must be recognized at the outset that useful ideas come slowly, and that because thereof, the system must be aggressively pushed not only at the outset but throughout its continuance, which should be indefinite. No employer should be discouraged because the suggestion boxes are not found filled to the brim at every collection.

As for the actual number of suggestions that may be received, however, we give the following information, which shows the experiences of other companies:

The Westinghouse Electric and Manufacturing Company, in the first four years of operation of their suggestion system, received something over 16,000 suggestions (an average of 4,000 a year), about 25 per cent of which were worthy of adoption and reward. Some of the suggestions adopted effected savings to the company running as high as \$2,500 a year, although, it is true, the majority of the ideas submitted were of minor character.

At the Schenectady Works of the General Electric Company about 5,000 suggestions are received every year, about 1,000 of which are found acceptable and worthy of reward.

Yawman & Erbe Manufacturing Company average 800 to 1,000 ideas a year, of which about 24 per cent are acceptable.

For two years the three affiliated public utilities of Pennsylvania car-

(Continued on page 88)

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The cutters can be changed very easily. A simple twist of a screw driver or the tang of a file is all that is necessary to remove the cutter from the holder. It will disengage immediately, leave no burrs, and will not jam in the holder.

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Production Operations on LeBlond Aircraft Engines

By HOWARD CAMPBELL

THIS, the second article on this subject, deals with the machining of connecting rods for the LeBlond engine. Articulated type rods of an extremely simple design are employed, being made from nickel chromium steel drop forgings. These parts are finished only where necessary or for the special purpose of removing excess weight, the skin being left on the H-section of the shanks to gain any possible advantage in strength.

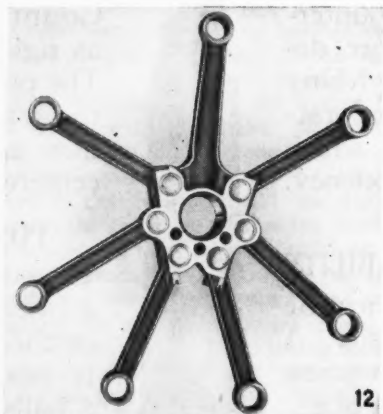


Fig. 12—Connecting rod assembly.

The rod and cap are separate forgings. The sides of the rod are ground in a surface grinding machine and the small end is drilled and reamed, then the rod is clamped in the fixture shown in Fig. 13, where the joint face is rough milled. A $1\frac{1}{2}$ -inch radius cutter, two .156-inch saws, and two 1-inch milling cutters are used for this operation, milling the joint face, two slots, and the crank pin bearing in one operation. A heavy feed is used.

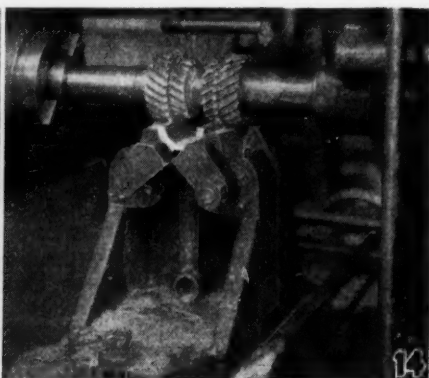
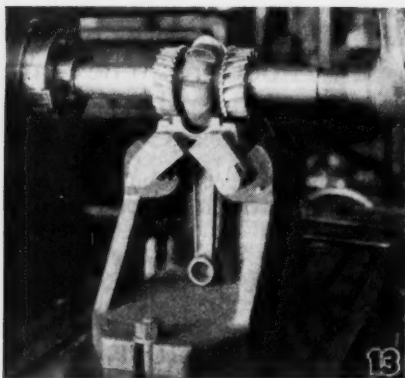


Fig. 13—Rough milling joint-face of rod. Fig. 14—The joint-face is semi-finished in this operation.

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The rod is semi-finish milled in the next operation, using the same type of fixture and the same size LeBlond milling machine. In this operation, Fig. 14, the radius cutter is replaced by two plain milling cutters, which finish the top surfaces adjacent to the bearing.

The cap having passed through approximately the same operations, the bolt holes are now drilled in these two parts, using a Fosdick two-spindle drill and the jigs shown in Fig. 15. Each piece locates from the bearing and is held in position by clamps which hold the piece up against the bushing plate, together with one at the side which keeps the

piece from slipping. As the holes are drilled at an angle, the jigs are each provided with a double base, as shown.

Figure 16 shows the jig used for drilling the link rod pin holes in the master rod. The rod is located by a pin which slips into the wrist pin hole at the small end and by a clamp which locks it securely in place at the large end. The bushing plate, which is hinged to the jig, is locked in place by clamp-bolts which are threaded into the body of the jig.

All flat surfaces having been machined, the rod and cap are bolted together, the assembled piece is clamped to the faceplate of a lathe, as shown in Fig. 17, and the crank bearing hole is bored and grooved. The piece is located by three pins in the fixture, one pin entering the wrist pin hole, the other two entering two of the holes

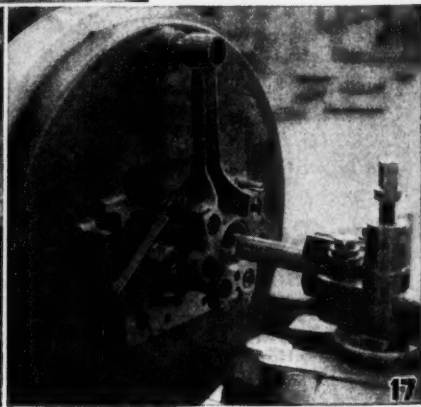
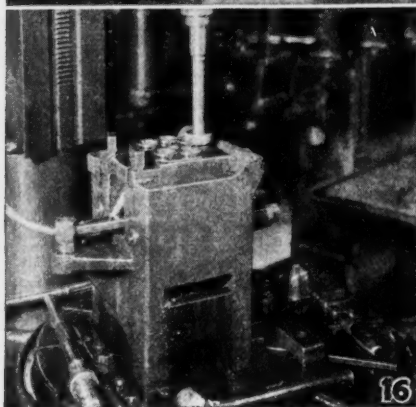
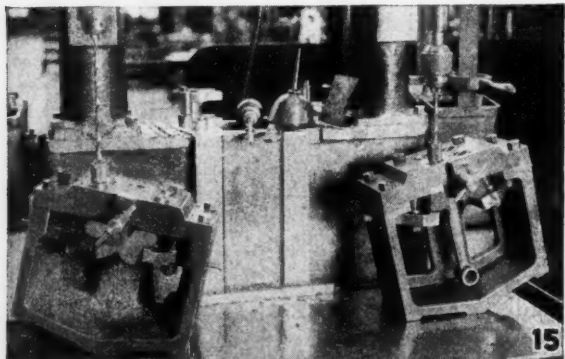


Fig. 15—Drilling bolt holes in rod and cap. Fig. 16—drilling link rod pin holes in master rod. Fig. 17—The bearing hole is bored and grooved in this operation.

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swing.

Gang Drills—
20 to 26-inch swing.

Barnes Upright Drills are made in a range of sizes from the 50-inch swing, required in the railroad shop, to the 15 and 20-inch sizes used in the small machine repair shop and garage service.

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by which the link rods are assembled to the master rod. After the hole has been bored to size with the boring tool shown in the illustration, a 12-thread tap is run through the hole to provide grooves for anchoring the babbitt firmly in the bearing.



Fig. 18—Pouring the babbitt bearing in a master rod. This centrifugal process of babbitting makes a solid, efficient bearing. The babbitt is melted in electrically-heated pots, equipped with pyrometers. Fig. 19—Babbitting fixture with rod in position.

The centrifugal method of babbitting connecting rods is employed, the complete outfit for this operation being shown in Fig. 18. The babbitt is melted in two electrically-heated General Electric melting pots, which, with the pyrometers that indicate the temperature of each pot, are shown in the center of the illustration. The babbitting fixture, shown in Fig. 19, consists primarily of a disc on the end of a shaft that is belted to run at a high rate of speed. Two lugs, bolted to the disc, provide for locating the large end of the rod, and a pin is anchored to the disc in such position that, when the hole in the small end of the rod is slipped over it, the center of the crankpin bearing will be centered with the disc. The clamp that holds the large end of

the rod in position, and which also serves as a "gate" for the metal, is drawn down against the rod by springs on the pins by which it is held. When ready to babbitt, the rod is brushed with acid, then "tinned" by being dipped slowly into the mol-

ten babbitt, after which it is placed in position on the disc and power applied. While the disc is revolving at a high rate of speed, the operator pours the babbitt into the rod through the hole in



the plate.

The centrifugal motion of the rod throws the metal against the wall of the bearing with such force that it anchors itself firmly.

After babbitting, the rods and caps are sawed apart, then the joint faces of the two parts are finished by milling, using fixtures similar to those shown in Figs. 13 and 14. Approximately .010 inch is removed in this operation.

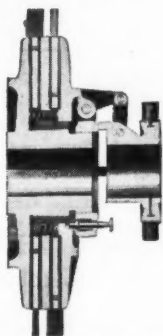
The operation shown in process in Fig. 20 is that of finishing the ends of the link rods. A Pratt & Whitney profiling machine is used, with a spiral cutter, as shown. The exact dimensions are obtained by the use of a former and former pin, the cutter following the contour outlined by

TWIN DISC CLUTCHES

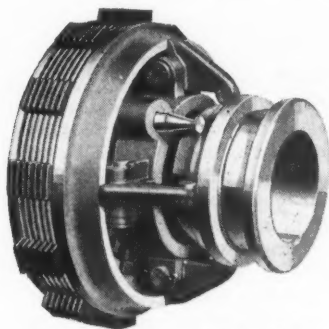
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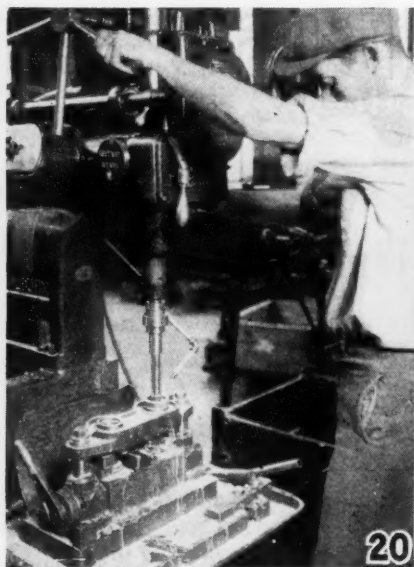


The multiple disc type, designed to run in a bath of oil, made in 2 $\frac{1}{4}$ " to 6 $\frac{7}{8}$ " diameter sizes.

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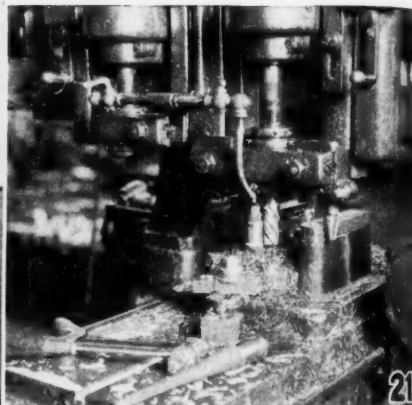
TWIN DISC CLUTCH COMPANY
RACINE WISCONSIN

feeding the former completely around the pin while the two are in contact.



reamer being used. Approximately .010 inch is left for the grinding operation. The piece is held in a jig so constructed that the jig-plate acts as the clamp, the plate being lowered

Fig. 20—Finishing the ends of the link rods in a profiling machine. Fig. 21—The link rods are drilled with this equipment.



The link rods are drilled and reamed with the equipment shown in Fig. 21, a 1-1/64 inch drill and a 1-1/16 inch

or raised by a cam mechanism, operated in one movement by the use of the lever at the end of the jig.

Suggestion System Operation

(Continued from page 28)

ried forward a contest-plan suggestion system that produced 3,948 suggestions, out of which 499 were accepted and paid for. On March 30, 1924, their plan was changed, the contest idea giving way to the continuous plan. Since then the number of suggestions received have averaged 4,500 a year, nearly 700 of which are acceptable and worthy.

While the monetary value of suggestions is abundant reason for the installation and maintenance of a system, not a little of the value comes in the more intangible form of increased interest in the work on the part of the employees, clear indica-

tion of eligibility for promotion, improved relations between management and men, and other results that are the natural outcome of a properly administered system.

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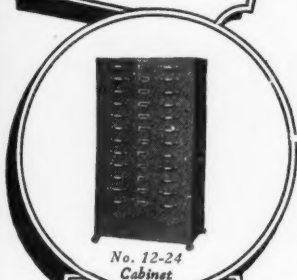


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Repairing Air and Steam Hose On D. & R. G. Railway

By JOS. C. COYLE

MAINTENANCE of all air appliances used on passenger and freight trains of a mountain railroad — keeping them in perfect condition at all times — is a very important part of the back shop routine. Of particular interest is a bench in the air room of the Denver & Rio Grande Western shop, at Burnham, where air and steam hose couplings are overhauled and deficient parts replaced. This bench is about 24 ft. long, and is equipped from end to end with air-operated devices for expediting the work of conditioning hose connections. The unique arrangement of air cylinders and clamps enables one man to recondition the couplings on approximately 225 sections of air hose in the course of a day's work.

At the left end of the bench, as shown in Fig. 1, an eight-inch air cylinder placed vertically on the bench operates a device for clipping the old coupling clamps from the hose. The upper knife of this device is bolted in the sheet steel frame, which is fastened to the workbench. The lower knife, which is 10 inches long, or about 6 inches longer than the upper one, pivots on a bolt through

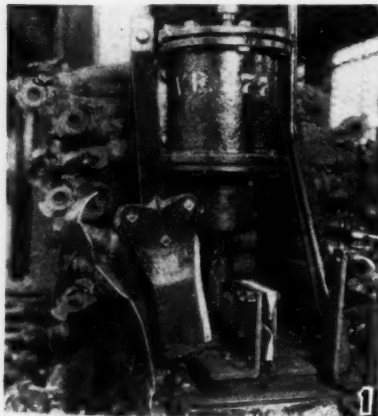


Fig. 1—Clipping Knives and Spreader

the frame, the rear end of the knife being attached to the lower end of the piston rod of an air cylinder, as shown in the illustration. The downward stroke of the piston forces the front end of the lower knife up against the upper knife, clipping the clamps in two as they are placed between the knives. The cut-off valve in the air line for operating the cylinder is seen just to the

right of the piston.

As the clamps are cut, they are placed with the clipped ends over the points of the pair of spreaders shown just to the left of the device previously described. This tool spreads the clamps open so that they can be removed and dropped through a sheet metal chute into a can provided for the purpose. As not much pressure is required for this operation, no cylinder is used, sufficient power being obtained from a branch from the air line of the other device, reduced to $\frac{1}{2}$ inch. The two jaws of the spreader, which come together in the small point seen at the top, are bolted in a frame of $\frac{1}{2}$ -in. steel plate about 12 inches high and 4 to 7 wide, with 1 inch between for

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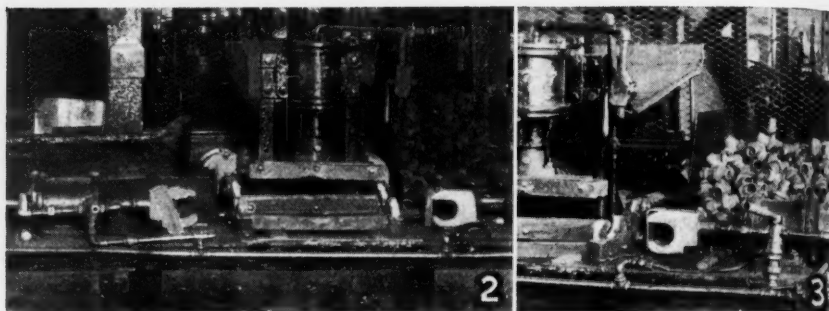


Fig. 2—Air-Operated Clamp and Tools for Replacing Nipples. Fig. 3—View of Clamp and Tools from Right Side.

the jaws and other parts. One of the latter is a wedge-shaped piece with a shank which is enclosed in a section of pipe at the bottom, in the manner of an air piston. As this piston is forced upward it contacts with a sloping extension of the lower part of each jaw, forcing the two jaws apart as it rises between them. The jaws are returned to their position by a coiled spring, attached to the outer edge of each, as seen in

firmly and holds it in place while the old couplings and nipples are pulled out and new ones pressed into place. Both of these operations are performed by an air cylinder at either end of the wooden clamp, with specially-forged chuck jaws on the plungers to fit the couplings and nipples. These jaws are solid, those for the couplings having a latch of $\frac{1}{2}$ -in. steel bar which clamps over the coupling to prevent its slipping out

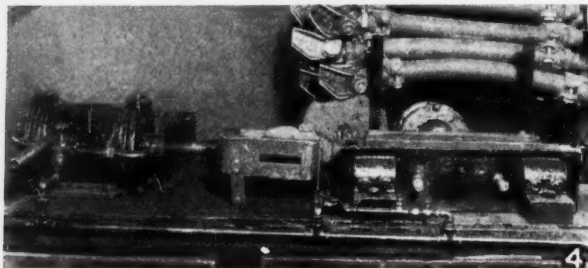


Fig. 4—Air-Operated Clamp and Tools for Replacing Couplings on Steam Hose

the illustration. A small cut-off valve below the edge of the bench operates the device.

Just back of the spreader and clipping cylinder is a rack on which sections of old hose coming in are piled until ready. In Fig. 2 is shown a clamp, faced with two hollowed sections of wood, which grips the hose

of the chuck. The air cylinders operating these chucks provide double action; that is, a separate air line is provided at each end of the cylinder, so that the plunger may be moved in either direction at will.

In order to obtain the necessary grip on the old couplings and nipples so that they can be pulled out, they are forced sideways into the chucks, with only about 3 inches of the air hose projecting from the wooden clamp at each end. The piston of each cylinder is at this time extended, of course. When the air is applied, the pistons draw into the cylinders, pulling the old couplings and nipples out

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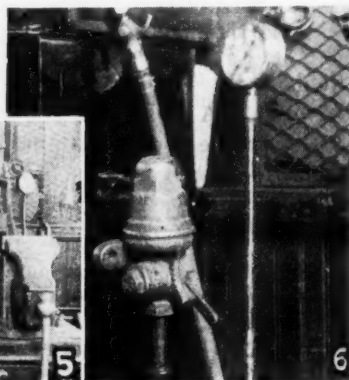
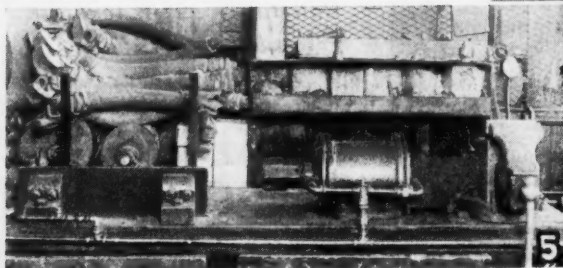
of the hose. To apply new fittings, these pieces are simply adjusted in the chucks and the operation of the pistons reversed, pushing the fittings into the hose ends, which are held firmly in position by the wooden clamp. The new hose clamps are then placed around the hose ends by hand and grasped by another set of jaws, located at either end of the wooden clamp and at right angles to it. These jaws are operated by separate air cylinders at the rear of the bench. The jaws compress the ends of the hose until bolts can be adjusted to hold the new clamps firm. Couplings and nipples are stored on the bench directly behind the respective devices with which they are used. The illustration Fig. 3 shows another view of the cylinder and the hose clamp jaws.

Couplings on steam hose are replaced in practically the same manner as those on the air hose, except that, as the couplings are larger, a box-like jig of 1-in. metal about 8 inches square is used in which to chuck the couplings, as shown in Fig. 4. Metal legs on casters hold the jig off the bench and in line with the work, as shown. In connection with this device a pair of wooden blocks,

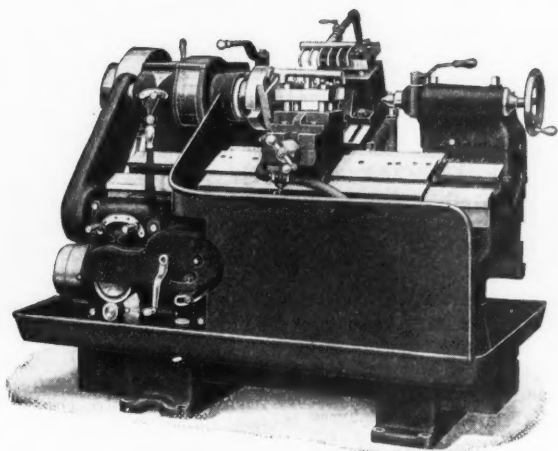
hollowed to fit the hose, are employed to hold the hose firm. One of the wooden jaws is fastened to a metal plate which is bolted to the bench, and the other is fastened to the piston of an air cylinder which can be seen below the stack of hose. The air-valves are so arranged that air can be let into either end of the cylinder, so as to drive the piston in either direction. Figure 5 shows another view of this device, together with the air cylinder at the right hand end.

A vise, placed at the end of the bench, provides for hand repairs. Projecting just above the top of this vise, in No. 5, may be seen a device for grinding and testing the valves in the steam hose. Valves to be ground are placed on the threaded end of a $\frac{1}{2}$ in. air line pipe, and the valve cap removed. A valve on the air line is shown in Fig. 6. After the cap has been removed, it is replaced with a cap from which two sides have been cut away to allow the workman to manipulate the valve between his fingers while grinding it in to its seat. The pressure gage shown in Fig. 6 is used in testing out the valves before they are removed from the device.

Fig. 5—Clamping Device for Steam Hose and Right Hand Cylinder. Fig. 6—Device for Grinding and Testing Steam Hose Valves. The valve cap is replaced with a cap with the side cut away, making it possible for the workman to manipulate the valve while grinding it in.



LeBlond Multi-Cut Lathes



LeBlond No. 12 Multi-Cut Lathe

The Multi-Cut is essentially a lathe, but with greater productive capacity. One trained operator on a Multi-Cut will replace four to six skilled mechanics, and a like number of lathes.

Send us your blue prints for production estimate and tooling recommendations.

The R. K. LeBlond Machine Tool Co.
CINCINNATI, OHIO

An Atkins Silver Steel Blade Gives 9 Weeks' Service

Ordinary Blade Gave Only 3 Days' Service

When users of Atkins SILVER STEEL Blue End Hack Saw Blades get better results than we claim for our product, every Machine Shop is interested. Read this:

**WM. H. DIEFENDERFER
MACHINE SHOP
TAMAQUA, PENNSYLVANIA**

Gentlemen:

It will not be necessary for me to send a piece of steel for a cutting demonstration, as I have tested your SILVER STEEL Hand Hack Saw Blades in the varied work of a machine shop.

The first blade I used gave me nine weeks of service without loss of a tooth which is eight and one-half weeks longer than I have been able to get the other varied make blades to do. This is an actual fact.

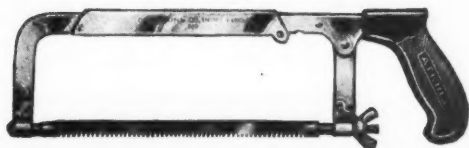
Very truly yours,

(Signed) WM. H. DIEFENDERFER.

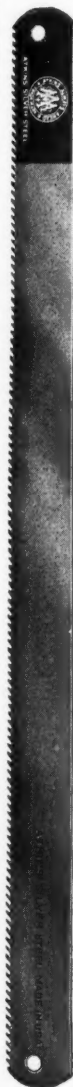
DEMAND THE BLADE WITH THE BLUE END

Send at once for information on how you can reduce your blade costs and increase your profits.

E. C. ATKINS & Co.
402 SOUTH ILLINOIS ST. INDIANAPOLIS, IND.



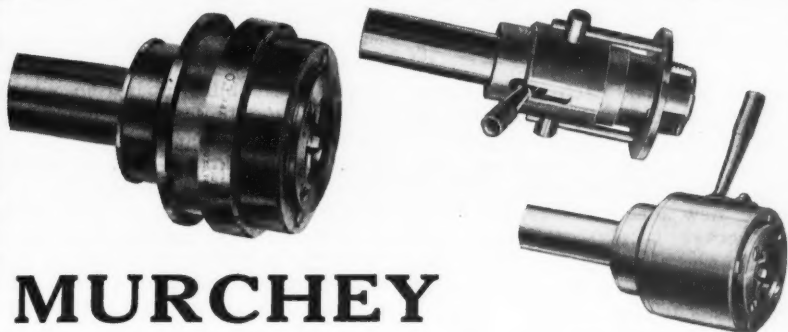
ATKINS No. 11 HACK SAW FRAME



FOREMAN		YEAR		MONTH	
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This Month					
Previously Reported					
To Date					
Standard					

What the Chart Does

With a few slide rule calculations taken from the previous day's records, the manager can quickly obtain comparative figures which will enable him to detect any rising costs.



MURCHEY

Tools Produce Accurate Threads!

MURCHEY Collapsible Taps and Self Opening Die Heads are built to produce accurate threads at high speeds. Many features are incorporated in the design of these tools to make this possible. For instance—

MURCHEY Tools are designed to prevent the slightest displacement of chasers, the cutting edges being solidly backed.

MURCHEY Chasers are hobbled and given a slight relief back of the cutting edge, which insures accurate lead and perfect threads.

MURCHEY Chasers are very easily adjusted to make tight or loose threads and to compensate for wear.

MURCHEY Tools are designed with a minimum number of working parts, which eliminates complicated adjustments and assures free operation.

MURCHEY
Tools will be sent on approval — just send us a blue print of your particular job.

Forty-six sizes of MURCHEY Collapsible Taps and fifty-five sizes of self opening die heads are fully described in the MURCHEY Catalog.

Write for your copy TODAY!

MURCHEY MACHINE & TOOL CO.

950 PORTER STREET, DETROIT, MICHIGAN

MURCHEY AGENTS

Cleveland Office, 4500 Euclid Ave.; Pittsburgh, Machinists' Supply Co., 325 Second Avenue; Chicago, R. E. Ellis Engineering Co., 621 Washington Blvd.; Haviland Wright, 307 N. Broad St., Philadelphia, Pa.; J. Van Doren, 52 Vesey St., N. Y. C.; Kemp Machinery Co., 215 North Calvert St., Baltimore, Md.; Machinists Tool Supply Co., 414 E. Third St., Los Angeles, Calif.; R. C. Neal Co., 76 Pearl St., Buffalo, N. Y.; 46 Andrews St., Rochester, N. Y.; 569 So. Clinton St., Syracuse, N. Y.; Coats Machine Tool Co., 14 Palmer St., Westminster, London, S. W., England.

check the time turned in against the time card records, to eliminate any possible discrepancies that may creep in.

In computation, each day's hours and units produced are totaled to the preceding days, so that a running total and a running average are obtained. When the end of the month is reached, new sheets are issued and a new average is started. Thus you have the actual number of hours per unit for every day in the month from the first day of the month to date.

At the bottom of the form are four lines, all self-explanatory: (1) Total this month: (2) Previously reported: (3) Total to date: (4) Standard. When the end of the month is reached your cost man fills in the first line. On the second line he places the combined data of the preceding months. The third line is for the combination of the two preceding lines, which gives you the exact record from the first of the year or from the time the system was inaugurated to date. The data for the fourth line can be arrived at as you see fit. The best previous single month's record is recommended. There you have a standard.

Here is how the plan works out in detail. You furnish 10, 20, or 50 of these sheets to your various foremen. Pick your cost clerk and have him make the round of the plant once a day at a specific time, and have the foreman instructed to have the figures ready for him. The clerk carries a little looseleaf book with duplicate sheets. He copies the data. In a half hour he is back at his desk and in another half hour he has performed his elementary arithmetic and obtained his averages. He places his little volume on your desk at 8 o'clock every morning and then checks his records with the time cards. You open the book and have the drop on

the 50 most important operations in your plant.

Suppose that from March 1st to March 15th the average time spent on a final assembling operation was 32 minutes, and that the standard is 36 minutes. The record shows that the department is improving. On another page in the book you find that it is taking 30 minutes to complete a job on which the standard time is 25 minutes, and you jot down on your memorandum pad that you had better visit that department. In 20 minutes or less you have thumbed through the 50 pages and are on your way out with the big stick in one hand and some commendation in the other. And when Alec and Bill and Charlie see you coming they know that you have indisputable facts and they can tell in advance pretty much what you are going to say.

Astonishing are the results that have been derived from this simple little system. And the real reason why the results are so great is because the system is so simple that every foreman can understand it as common sense and none of them can characterize it as red tape. Each foreman is automatically entered into a competition with himself. He feels that it is distinctly up to him to make a better record each month; in fact, each day. Time-wasting details which you have had to fight day after day and bring up for correction time after time are watched with jealous attention. Men who soldier are eliminated. Little suggestions for improved methods and labor-saving devices come to fruition. Scrap losses are cut down.

Incoming materials are watched and the department foreman won't touch them unless they can be fitted together without a file or hack-saw. If stock isn't received evenly and on time, he raises a kick that gets re-

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The Aprons of All Sizes

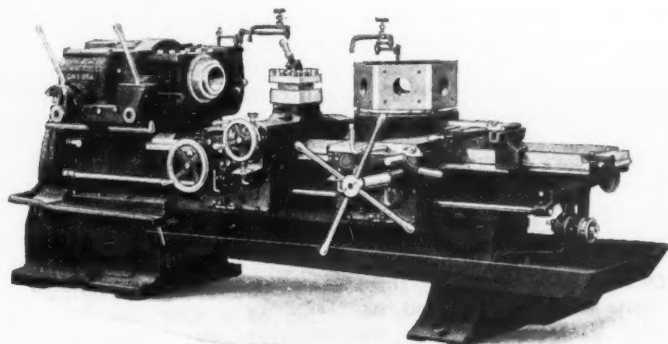
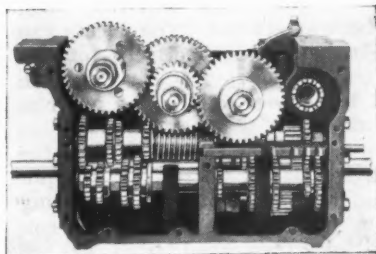
"Duo Control" Acme Turret Lathes

Are Equipped with Ball Bearings

Ease of control is an outstanding feature in the design of these duo control aprons.

Twelve independent forward and reverse feed changes are obtained in each apron.

All changes are made through sliding gears—heat treated and oil hardened—mounted on square shafts which revolve in ball bearings.



17" and 4 1/2" Cincinnati Acme Heavy Type Universal Turret Lathe

The Acme Machine Tool Co., Cincinnati, Ohio

sults. The enthusiasm of the foreman makes an intensely interesting game out of the job, and a smoother running establishment is practically assured. The costs go down. Reference again to this chart shows how the number of hours dropped in one month on the operation of motor assembly. Today the figures show on this same job a drop to 75 per cent of the original time required, when the job was started. The sheets can be adapted very effectively for the production manager's use, as each sheet bears the exact count of units manufactured each day.

The addition of two columns to the sheet, if not considered too complicating, will be helpful in accounting and in studying the sheet. The columns will then read from left to right—total hours today, total hours this month, units delivered today, units delivered this month, hours per unit this month. Obviously the continuous addition of the first column of figures determines the figure for the second column and continuous addition of the third determines the fourth. Division of the second by the fourth gives the final figure for the fifth.

The system can be applied even to non-productive departments, as, for instance, the inspection department. It is only necessary to enter the total hours worked in the inspection department and the total units completed in the assembly room. The result will show hours of inspection per finished unit. If two or three different units are manufactured, assign a value to each, based on the selling price.

The subject of bonus is too complicated and voluminous to discuss in detail in this article, but it may be suggested that the system can be applied admirably in combination with bonus to foreman for decreasing the

cost of production in his department.

This article has been prepared, in the main, to be of suggestive help in reducing hours of labor and increasing efficiency, and, therefore, the subject of material and overhead has not been touched upon. The following simple outline is offered to show how a complete cost can be arrived at in combination with the system, inexpensively but fairly accurately.

1. To obtain labor cost, assign a standing order number for all productive work on the unit manufactured. Draw the time from the time cards and enter it with the total complete units manufactured in a general sheet identical in form with the one described. Simple division of one column by the other gives the total productive labor per unit manufactured. Multiply this result by the average wage per hour of the plant. The final result is productive labor cost per unit.

2. List of the raw materials used in the construction of one complete unit. Figure from your purchasing records the costs of these materials. The addition of the costs gives you material cost per unit.

3. Sum up all other expenses from all other accounts, including salaries, light, heat, water, rent, equipment, tools, interest, depreciation, and so on and divide by the total units manufactured. The quotient is overhead expense per unit.

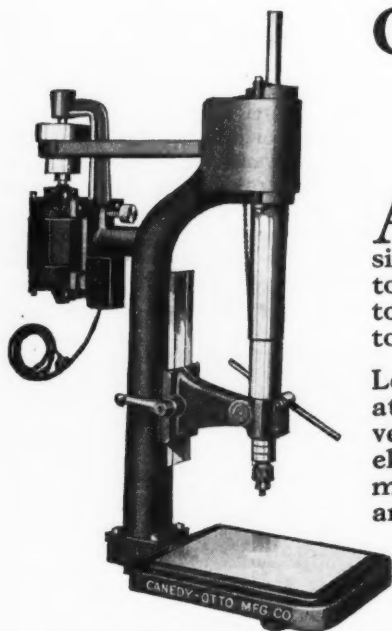
4. Summation of the three accounts results in complete cost per unit.

If you are just beginning production of a new unit, the labor cost naturally will be high the first month, owing to the fact that considerable labor is necessary before the stock comes through for the first unit. As the data is continued from month to month, the error decreases and diminishes to nothing when you dis-

(Continued on page 92)

—SAFE— At High Speeds!

C-O DRILLS OPERATE AT HIGHER SPEEDS!



C-O 14-Inch High Speed
Sliding Head Sensitive Drill

AMPLE protection of all moving parts, plus a well-balanced design, allow this Canedy-Otto Drill to be run at very high speeds—up to 10,000 R. P. M.—without injury to the machine.

Less power is required for the operation of C-O Drills because the vertical mounting of the motor eliminates idlers, pulleys, intermediate cone pulleys and all twists and turns in belts which reduce the friction considerably.

The drill is furnished complete ready for operation by attaching to a lamp socket and is ball bearing equipped throughout.

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All Branches

San Francisco Branch:
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Ideas From Readers

This department is a clearing-house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay \$5 for each one published.

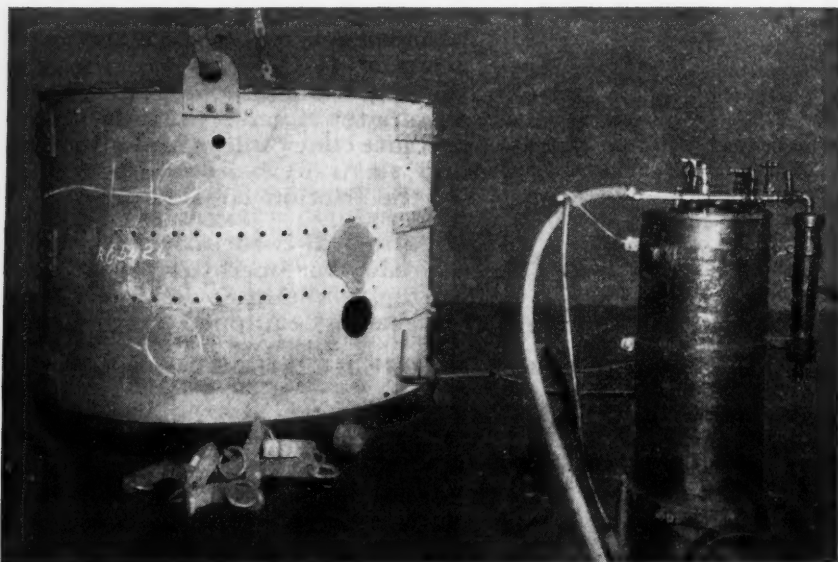
A Good Home-Made Tire Heater

By R. J. FARRINGTON

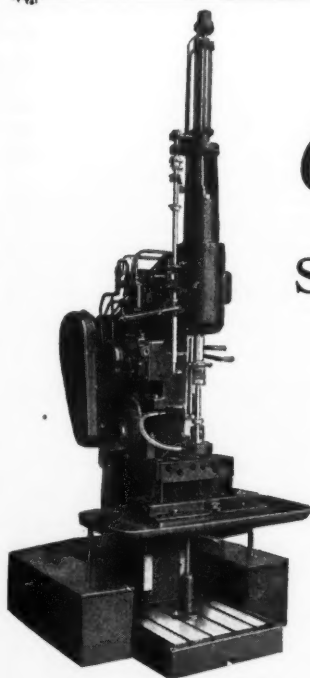
AMONG the many pieces of equipment which have been developed in the shops of the P. & L. E. Railroad at McKees Rocks, Pa., is the tire-heater shown in the illustration. The heater will heat eight tires in not more than 25 minutes. The outfit consists of the heater, or receptacle in which the tires are placed for heating, the oil tank, and the burner. The

fuel consists of crude oil and the necessary amount of air.

The heater wall and top, which forms one unit, is made of $\frac{5}{8}$ -in. scrap boiler plate. The base upon which it sets is formed of a smoke box ring, which encloses a double layer of fire bricks. When the tires have been placed in position on the base, the heater is lowered over them with the aid of the traveling crane. The oil tank, which is of $\frac{3}{4}$ -in. boiler plate, is mounted on wheels for portability, and the pipe line through which the oil is conveyed to the burner is attached to the tank after it has been



P. & L. E. Tire Heater In Position For Use



Cylinder Honing

Self-Oiling, All Geared

ALL BALL-BEARING



THE No. 249 Self-Oiling, All-Geared Honing Machine with Oilgear control, illustrated, is a single spindle machine for honing separate cylinders or multiple cylinders progressively. No. 214, not shown, is a multiple spindle machine for honing two or more cylinder bores simultaneously.

Every cylinder honed by these machines will be exactly the same diameter from end to end without a trace of bell mouth, perfectly round, free from chatter marks and "fuzz," accurate within .0005". From reamed bore to honed finish is a matter of

seconds—60 or less usually, seldom more than 120. Quick acting fixtures facilitate placement and removal of work. Floor space is saved, operating costs and capital investment for cylinder finishing are reduced. On the test block, piston rings in honed cylinders seat and bring up the power in about one-third the time required by other finishes.

Write for detailed descriptions and specifications on these machines. Also on Self-Oiling, All-Geared Drilling and Tapping Machines.

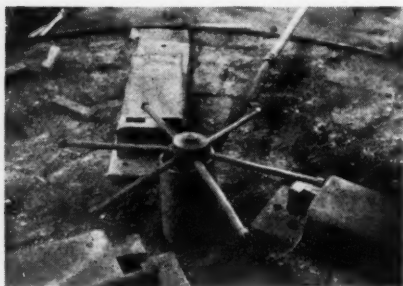
Send For Catalog U

BARNES DRILL CO.

801-851 CHESTNUT STREET

ROCKFORD, ILLINOIS

placed in position. The burner consists of six lengths of pipe, in each of which a row of 3/32-in. holes has



Burner For Tire Heater

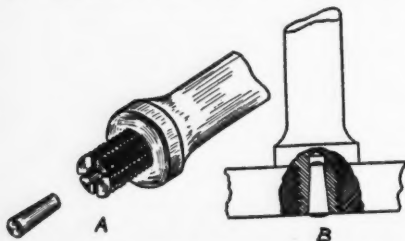
been drilled. The outfit is efficient, easy to handle, and can be constructed at a very low cost.

An Emergency Repair to a Threaded Part

By PAUL A. BARD

THE sketch shows a quick method of making an emergency repair to a threaded part of a machine. The threads on this part had become so badly worn that it was no longer possible to keep the part tight. The repair shown at A proved entirely satisfactory and permitted the machine to be placed in operation with a minimum loss of time.

A hole was first drilled axially in the threaded end of the part, for



Using Taper Pin to Repair Worn Threaded Part

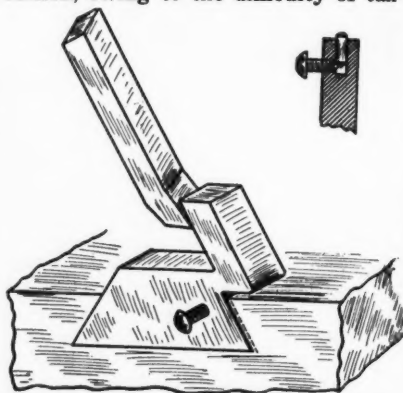
which a drill was used that was two sizes larger than the small end of the taper pin. The hole was taper reamed, then the end was slitted with a saw into four sections. After the part was placed in position, the taper pin was driven in, spreading the threaded end in the hole.

A partial sectional view of the part in position is shown at B. The object of using a larger drill was to give clearance to the end of the pin, as shown at B, so that it would not seat in the solid portion of the piece.

Tool-setting Gage For Planing Dovetail Grooves

By R. H. KASPER

PLANING dovetail grooves accurately is, at best, a difficult proposition, owing to the difficulty of tak-



Gage for Setting Tool to Plane Dovetail. Insert shows method of locking gage in groove.

ing accurate measurements and also to the fact that measurements can only be taken on the completion of a cut. If the groove is found undersize, it means that another complete cut must be finished before another measurement can be taken; if the groove is found oversize, it is too late

FOSDICK

13" Superspeed Ball Bearing Sensitive Drill Will Reduce Your Drill Breakage

Ball Bearings for every journal. Each bearing protected by dirt-proof metal oil retainers and properly mounted.

Spiral Gear Drive. Spiral gears running in oil.

Running Parts Balanced. Every revolving member is balanced so that all vibration at high speeds is eliminated, and drill breakage is reduced to a minimum.

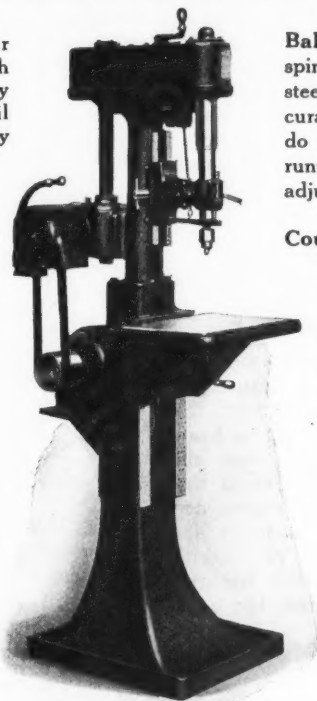
Speed Changes. The belt is shifted and speeds are changed by a single turn of the small handle on top. Belts can be replaced easily.

Adjustable Feed Lever. The feed lever is adjustable to various positions for convenience of operation. A quick return star wheel enables the operator to feed, return, or position the drill rapidly with either hand.

Balanced Spindle. The spindle is of high carbon steel, multiple splined, accurately ground, tested to do perfect alignment and running balance, and has adjustment to take up wear.

Counterbalanced Elevating Table. The elevating table is of the quick-acting counterbalanced type, with perfectly scraped slide gibbed to the pedestal. Handle at front of machine for clamping.

Counterbalanced Head. The head is gibbed to the dovetailed slide on the column, and is counterbalanced to prevent dropping when unclamped.



If you are looking for ways and means to cut costs, ask for specifications and prices on this machine.

THE FOSDICK MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

for anything.

The gage shown in the sketch was made to enable the planer hand to set his tool accurately without taking a trial cut. One side of the groove is finish-planed while the other side is roughed approximately to size. The gage is then locked in the groove and the tool is set to the inner angular surface of the gage, which is a continuation of the finished side of the groove. The gage is then removed and the finish cut taken, as shown by the dotted line. This gage is also used to check the angular setting of the planer head. The method of locking the gage in the groove is shown in the sectional view.

Jig For Double-Top Boiler Checks

By J. H. HAHN

THE illustration shows two views of a very handy indexing fixture for use in machining the bodies of the double-top boiler checks used on locomotives. The boiler check has six connections—two on the front of the body to which the cut-off valves are fitted, two on the lower side to accommodate the branch or "feed" pipes, and two on the top for the check caps. The joint where the body



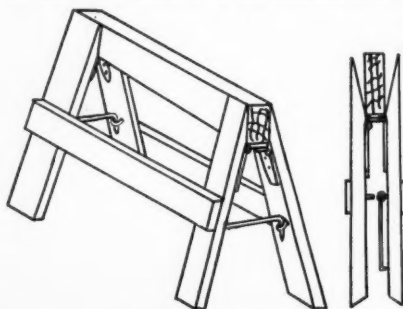
Jig for machining double-top boiler checks

fits onto the boiler is first faced, and the ball seat is machined to a template, which is usually done on an engine lathe. Then the valve is bolted to the fixture, as shown, and the rest of the operations are completed. The flat seats for the check valves are machined at the same time the valve body is bored, faced, and the thread cut, and the cut-out valve seats are handled in like manner. In shops where a number of check valve bodies are machined at a time, this fixture will be found very useful.

A Saw Horse That Saves Space

By H. L. WHEELER

THE conventional type of saw horse has many disadvantages in spite of the fact that it is an almost indis-



A Folding Saw Horse

pensable tool. It is always in the way when not in use, and takes up more storage space than rightfully belongs to it, especially in a small shop where floor space is at a premium.

In building a saw horse as shown

(Continued on page 92)

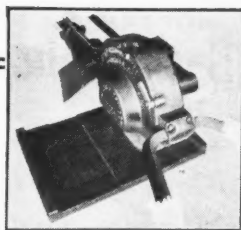
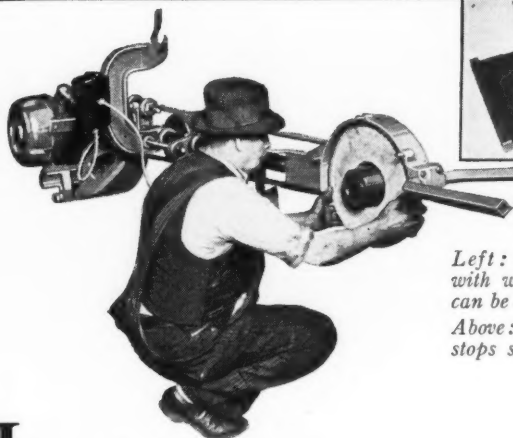
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Left: Showing the ease with which abrasive wheels can be changed.

Above: Perfect visibility stops spoilage losses.

Here's a new type grinder that speeds production 30%

Mail the coupon *now* for descriptive folder on the new SAFETY "De Luxe" Portable Grinder.

HERE is an amazing new grinder—a portable built especially for high speed work with organic-bonded wheels. It embodies features never before found on any portable grinder.

Its extreme ease of changing wheels saves hours of time. The "Inter-lock" saves money on abrasive wheels and speeds up production 30%. And perfect visibility stops spoilage losses.

Get the facts about this remarkable grinder today and learn all about our *complete* line of grinding wheels and grinding machinery.

SAFETY Grinders are designed and built to lower grinding costs. They're built to stand up under strains, shocks and high pressure work . . . to give years of trouble-free service. They're made in a variety of types and models for any kind of work. Write today for our complete catalog.



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- () Bulletin S-29-3 on the "De Luxe" Portable
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- () The Safety Abrasive Wheel Catalog.

(Name of Individual)

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MODERN MachineShop

HOWARD CAMPBELL - - Editor

Industrial Progress Gauged By Machine Tool Show

THE engineering developments evident in the design of the new metal working machines which were on display at the National Machine Tool Builders' Exposition in Cleveland could undoubtedly be accepted as an index of the progress of American industry during the last two years. Machine tools and their accessories are the "master tools" with which all other manufacturing equipment is produced, therefore the advance in mechanical engineering is reflected, to a large extent, in the progress of industry in general.

Tradition, insofar as the design of metal-working machines is concerned, has long since been abandoned and each product of the modern machine tool builder is an expression of engineering skill and ability. The machine tool of today is designed with every consideration for the task expected of it, the amount of production probable, and the accuracy with which it will be expected to perform.

Manufacturers and government officials were present from England, France, Germany, Belgium, Russia, Czecho-Slovakia, and Japan, indicating the importance placed by foreign governments and manufacturers upon an exhibition of American machine tools. The superiority of American engineering and production methods over the methods in use in other countries is universally recognized and America is regarded as a training school for the rest of the world.

An interesting feature of the show was the very evident appreciation,

by the modern manufacturer, of the bearing which the ability of each of his plant executives may have upon efficiency of the plant as a whole, and the necessity for making available to them the wealth of information which was to be had on every hand at the show. The works managers, master mechanics, plant engineers, superintendents, and foremen who stopped at the MODERN MACHINE SHOP booth represented practically every state in the Union as well as many of the provinces of Canada. It is apparent that the plant executive is being called upon to assume a larger share of responsibility than has been allotted to him heretofore, the natural sequence of which is that he must be of a higher type and better informed. This is as it should be; the industry can progress only as fast as the individual members of it progress.

These Are the "Good Old Days"

JAMES J. DAVIS, Secretary of Labor, says that the standard of living in the United States today is the highest ever attained by any people in any country in the entire history of the world. The wealth of the country is greater and the costs of living are higher, but the opportunities are also greater and the wealth is more evenly distributed than ever before. Whereas a few decades ago the wealth of the country was concentrated in a comparatively few hands, a large part of the stocks of our largest and most stable industries and public service corporations today is distributed among the so-called "wage earners." It seems to be only a matter of time until the ideal economic system or "Utopia" which has been the dream of idealists for many years will have become a practical reality.

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Rockwell Hardness Testers

at work on inspection at

E. C. ATKINS & COMPANY, INDIANAPOLIS

THE Rockwell is used to make sure that all of one's product is as good as the best. That is the way to build and to hold a good name. No firm is entitled to a good reputation because some of its product is good, for of what use or protection is that to whoever gets the less good portion?

Others have many Rockwells.

Have you even one?

WILSON-MAEULEN ©
INCORPORATED

Concord Avenue and 143rd Street

New York

New Shop Equipment

Barnes No. 242 Production Self-Oiling All-Geared Drilling and Tapping Machine

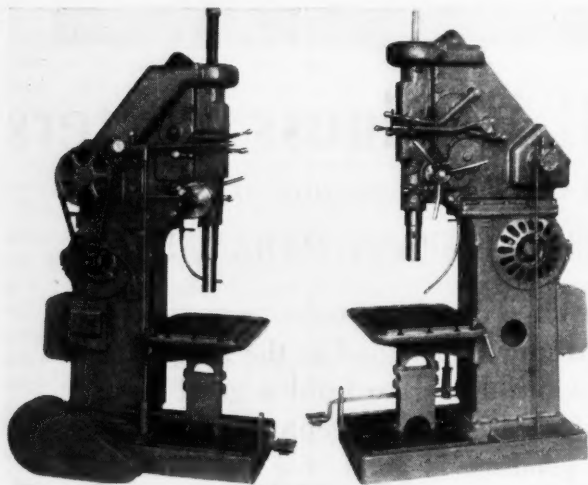
The illustrations show both left and right sides of the No. 242 Production Self-Oiling All-Geared Drilling and Tapping machine which has been developed by the Barnes Drill Company, 840

load which is required in driving modern high speed twist drills and other tools. The eight quick change geared speeds are controlled by levers which extend to the front of the machine. There are also eight spur geared feeds of the quick change type and controlled by accessible levers. The settings for all speeds and feeds are all clearly indicated on brass plates. The spindle and

sleeve are made of "Nitalloy" steel, both surfaces being hardened after machining by the "Nitriding" process which gives an extremely hard case about $\frac{1}{16}$ -inch deep. The process prevents warpage or distortion, eliminating the necessity of grinding after heat treating. This also permits the spindle to run on roller bearings, which are self oiling with rollers contacting directly upon the hardened surfaces of the spindle and sleeve, no case or race being used. Timken bearings are used for all speed change shafts and for the spiral crown gears.

The speed change gears are of chrome nickel steel, heat treated. The crown gears are of forging steel cut with spiral teeth and hardened. Threaded collars provide for adjustment. Rack teeth are cut integral in the Nitalloy steel sleeve, wholly within the circle, and torque is taken by hardened collars.

The machine shown in the illustration is equipped with Texrope drive, properly guarded. A silent chain, en-

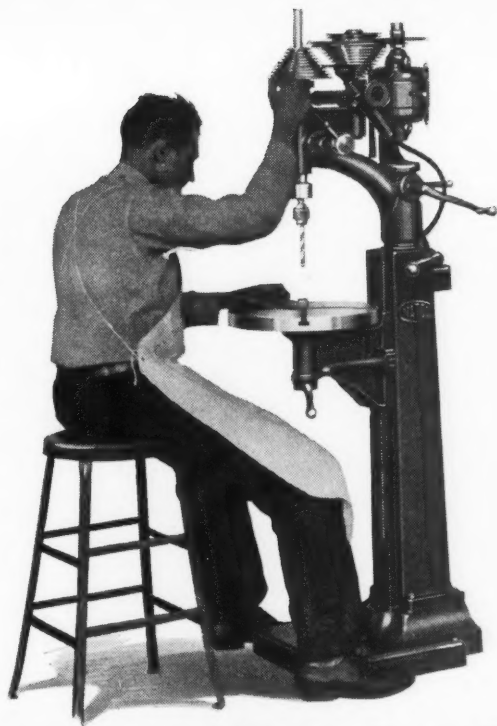


(Left)—Left side of Barnes No. 242 Production Drill and Tapper with silent chain guard removed. Note foot pedal reset for automatic reverse lever. (Right)—View of machine from right side. Note quick change of speed levers extended to front, also spacing blocks under table to prevent deflection.

Chestnut Street, Rockford, Illinois. This machine is of the usual Barnes vertical construction and has a capacity of 2 inches in mild steel.

The head is exceptionally thick from front to rear, where it is flanged and securely bolted to the massive column, minimizing the tendency to lift away or to deflection caused by the thrust

**NO BELTS
NO GEARS
REQUIRED**



NATCO MODEL C-215 UNIVERSAL SENSITIVE DRILLER

THE Model C-215 NATCO Universal Sensitive Driller is a small machine operated by hand feed using the patented GIBBS "V" Disc type of transmission for change of speeds, which eliminates all gears and all belts. It is built upon entirely new principles having many desirable time saving features and flexible adjustments. Ask for a circular covering this new machine.

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U. S. A.

cased, may be used, or a tight pulley will be supplied if required. An automatic reverse feature of exceptionally quick action is provided for tapping, giving a reverse speed of $1\frac{1}{4}$ to 1.

The extreme height of the machine is 106 $\frac{1}{2}$ in.; swing 24 in.; distance from column to center of table, 12 $\frac{1}{4}$ in.; maximum distance from No. 4 taper spindle to regular table, 32 $\frac{1}{2}$ inches; maximum distance from spindle base, 46 $\frac{1}{2}$ inches; size of working surface of working table, 28 x 18 inches. The diameter of the spindle at the driving end is 2 inches; diameter of spindle nose, 3 $\frac{1}{8}$ inches; diameter of spindle sleeve, 3 $\frac{3}{8}$ inches; vertical travel of spindle, 16 inches; vertical travel of table, 23 inches. The spindle is regularly fitted with Morse No. 4 taper, but No. 5 taper can be supplied if required. Ratio of back gears, 4 to 1; size of drive pulley, 14 x 5 in.; speed of drive pulley, 400 r.p.m.; floor space, 50x35 inches; weight with coolant pump and motor drive, 325 pounds.

Oesterlein No. 36 Mil-O-Matic

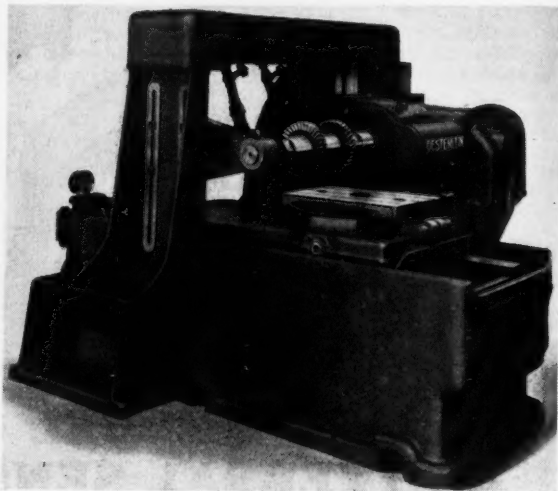
A milling machine of the automatically operated, hydraulic speed, bed type, designed to be available as a single spindle, duplex, vertical or multiple spindle machine, has been developed by The Oesterlein Machine Company, Cincinnati, Ohio. The machine can be used with a variety of standard bed and table lengths, and special heads may also be applied, depending upon requirements. It may be equipped with either a plain reciprocating table having a working surface 21 x 48 inches, affording a 36-inch feed, or with an automatic indexing table of 14 x 24 inches working surface mounted on a slide which has a 24-inch feed. As an indexing machine, the table makes a half turn at the end of its return stroke, advancing automatically to the cut.

The drive is particularly unique in that the spindle head is an entirely self-

contained unit. It carries its own motor, starting, stopping and reversing mechanism and control lever, pick-off speed gears, and all adjustable controls. Being self-contained it can be mounted at any angle or in any position to suit requirements. Shafts and bevel gears for bringing the power to the head are completely eliminated.

The operation of the machine is as follows:

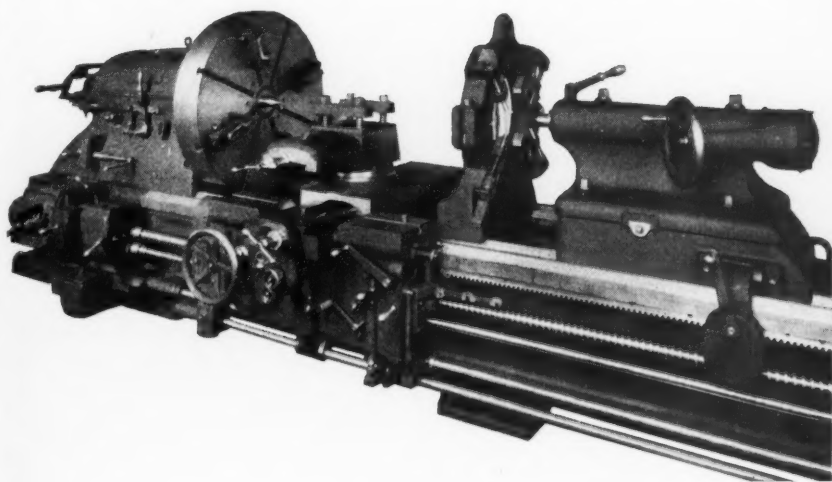
When the parts to be milled have been clamped in place, the operator pushes a lever which starts rapid traverse of the work toward the cutter.



Oesterlein No. 36 Mil-O-Matic

From this point, the machine operates automatically, the operator being required only to remove finished work and reload the fixtures. From rapid traverse the table movement slows down to feeding rate for which it is set. At the end of the cut, the quick return is automatically engaged, bringing the table back to starting position at a rate of 180 inches per minute. As the table nears the end of the return stroke, the index table is released and as the forward rapid traverse begins again, it is automatically indexed and locked again. The movement of the table is controlled by Oil-Gear equipment, either a constant, varying or intermittent feed being available. While the table ordinar-

They Must Be Good!



BRADFORD LATHES

are made in both
all geared motor
drive, and cone pul-
ley types in sizes
from 14" to 50"
inclusive.

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ORDERS for replacement parts and re-
quests for service are so few and far
between that we know the thousands of
BRADFORD installations throughout the
country must be good.

No news is good news in the machine tool
business, for machine buyers are not silent
sufferers when equipment falls down, and on
more than two thousand BRADFORD in-
stallations we have not as yet been called
upon to furnish a repair part. Such per-
formance proves—

Bradford Superiority

THE BRADFORD MACHINE TOOL CO.
659 EVANS STREET CINCINNATI, OHIO

Precision Lathe Builders Since 1840

ily continues to reciprocate and index, an interference device is provided which can be set to stop the table at the end of its travel for the purpose of safety in cases where the operator is running more than one machine.

The index table is mounted on radial ball bearings, the upper bearing being $8\frac{1}{2}$ inches diameter H. D., and the lower one and smaller double race bearing affording an outboard support for the indexing pinion. The indexing mechanism and ball bearings are enclosed in a grease-tight case filled with lubricant.

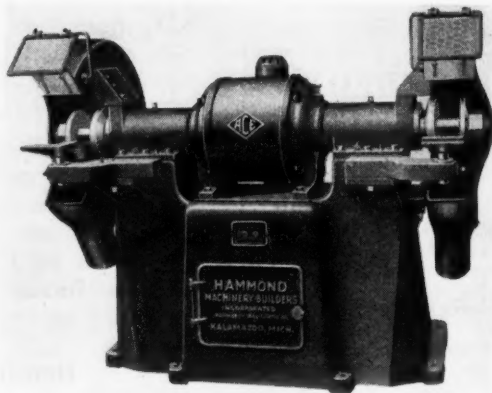
The gears within the spindle head are of alloy steel, heat treated, multiple splined and enclosed in grease-tight cases. Anti-friction bearings are used throughout the drive, including the spindle, which runs in two $12\frac{1}{2}$ -inch and two $5\frac{1}{2}$ -inch Timken roller bearings. The spindle is of chrome nickel steel, heat treated, and has standard nose. The base of the column on which the spindle head is mounted has a compartment into which is mounted a direct connected motor-driven Oil-Gear unit for furnishing table feed. The column is keyed and bolted to the bed. A heavy tie piece interlocks it to the outboard bearing support, giving the effect of planer construction and affording more rigid support for the arbor. The tie piece and outboard bearing support may be omitted for light jobs and a Vee-flat Overarm used instead. The bed and table have ways of hardened and ground steel strips, doweled and bolted in place. They are so located as to support the entire width and length of the table, which does not overrun the bearing in any position.

The machine is equipped with an individual motor driven coolant pump with capacity to deliver 40 gallons of coolant per minute. Each standard spindle is driven by a 10 h.p., 1740 r.p.m. motor, and a 5 h.p., 1200 r.p.m. motor drives the Oil-Gear unit. The complete single spindle machine, when furnished with tie piece and outboard arbor support weighs approximately 14,000 lbs. Normal range of spindle speeds available, 20 to 242. Feeds from 0 to 30 inches per minute.

Type "WH" Ace H. D. Electric Grinder

A heavy duty floor grinder known as the Type "WH," and built in three sizes—5, $7\frac{1}{2}$, and 10 h.p.—has been brought out by Hammond Machinery Builders, Inc., 1618 Douglas Avenue, Kalamazoo, Michigan. This machine is designed to meet the demands for a machine with maximum power and rigidity. It is equipped with a totally enclosed motor, complete with patented air cleaner and four oversize ball bearings, mounted on a steel spindle. An automatic motor starter having thermal overload protection with push button control conveniently mounted on the pedestal is standard equipment.

The motor is of the 40 degree C type, built to A. I. E. E. standard, and is guaranteed to develop nameplate horsepower rating. It is also liberally proportioned to withstand momentary overloads of 100 per cent beyond its capacity. The spindle is oversize, ground and balanced to insure smooth operation. Flat top threads insure longer life and utmost security in holding wheels. Timken tapered roller bearings are also supplied without extra charge. Gener-



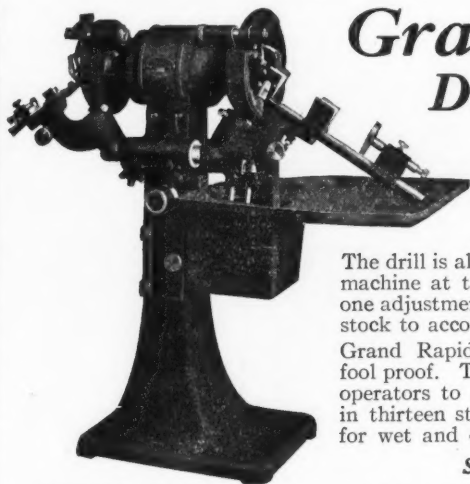
Type "WH" Ace Heavy Duty Electric Grinder

ous oil reservoirs are provided with convenient oil cup, oil level gage and drain plug for ease in flushing the bearing chamber. The wheel guards, which are of an approved design, are made of boiler plate steel with hinged doors. The guards are adjustable to

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Grand Rapids Drill Grinders

**—grind perfect points
on your drills in less
time than required by
any other method!**

The drill is always automatically placed in the machine at the correct grinding angle. Only one adjustment is necessary—that of the tail-stock to accommodate the length of the drill.

Grand Rapids drill grinders are practically fool proof. The simple design allows unskilled operators to grind perfect points. It is built in thirteen styles, both floor and bench type for wet and dry grinding.

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**"SHARP TOOLS
CUT COSTS"**

GALLMEYER & LIVINGSTON CO.
348 Straight Ave., S.W., Grand Rapids Mich., U.S.A.

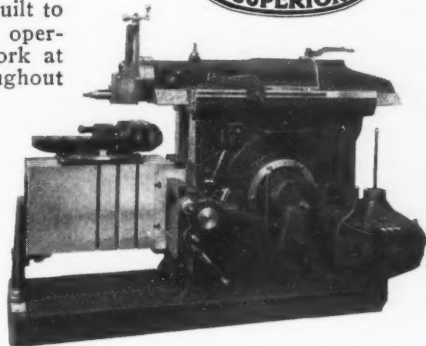
A REAL SHAPER

FOR EFFICIENT PERFORMANCE!

COLUMBIA Superior Shapers are built to shorten production time and cut operating costs by producing accurate work at top speeds. They are heavier throughout than most other makes, which gives them sufficient bulk to withstand the working stress when taking heavy cuts.

Users of Columbia Superior Shapers such as General Electric Company, Santa Fe Railroad, General Motors Corp., and scores of other concerns have found Columbia Superior Shapers to be "A Real Shaper For Efficient Performance."

Write For Bulletin No. 17



THE COLUMBIA MACHINE TOOL CO.
HAMILTON, OHIO

compensate for wear of grinding wheels and are fitted with chip breakers, eye shield and exhaust connection. The tool rests are adjustable and removable. The machine will be furnished for 220, 440, and 550 volt, two or three phase, 25, 40, 50 and 60 cycle, A. C., or 110, 220 or 550 volt D. C.

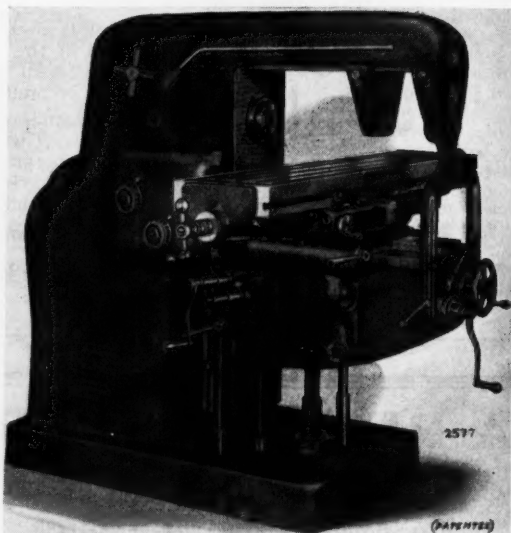
Cincinnati No. 30 Knee and Column Type Miller

A milling machine which is said to bring to milling machine users a new and high standard of operating convenience, accuracy and durability, known as the Cincinnati No. 30 Knee and Column Type Miller, has been placed on the market by The Cincinnati Milling Machine Company, Cincinnati, Ohio. The machine is being marketed in the plain, universal and vertical types, to be driven by belt or enclosed chain motor drive. The Cincinnati rectangular overarm has been increased in size to give added strength, and the two arbor supports have been improved by making them of aluminum and providing automatic lubrication for the bearing collars. The supports are 50 per cent lighter, yet stronger, than those of cast iron, which feature will be appreciated by the operator.

An improved and simplified method of changing feeds and speeds has been provided through an automatic power shaft for the spindle speeds as well as the table feeds, controllable from either the front or rear of the machine. To change speed, the operator disengages the starting lever (A) and throws the speed and feed control lever (E) to "Speed." The speed dial (B) rotates while the lever is in this position. When the speed desired on colored dial (B) appears opposite the arrow, the operator releases control lever (E), pushes starting lever (A) away from the column, brings it back and pushes it up. To change feeds, the operator throws the speed and feed control lever (E) to "Feed" position on the plate. This lever is held on this position until the desired feed on the colored dial (D) registers with

the arrow and is then released. There are sixteen speeds and sixteen feeds clearly indicated on the upper dial on the side of the machine, ranging from 14 to 450 r.p.m.

Each movement has a power rapid traverse in addition to the power feed, operated from either front or rear. The rapid traverse is available with spindle still or running. The rapid traverse for the table on the plain machine can be automatically disengaged by dogs on



Cincinnati No. 30 Knee and Column Type Miller

the side of the table. Provision is made for making hand adjustments at the rear as well as the front to provide for ease and accuracy in obtaining cross and vertical adjustments.

Anti-friction bearings are used throughout the spindle drive, being applied at both front and rear on the spindle with a floating rear bearing. A multiple disc oil clutch is also used. Gear contacts in the spindle drive have been reduced, giving four on the forward and five on the reverse, thus making a positive direct drive and assuring longer life. A cutter coolant pump having a capacity of eight gallons per minute is supplied as regular equipment. The coolant drains from the table into the saddle through the large opening at the rear,

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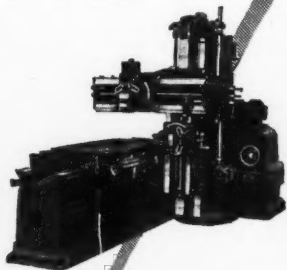
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NEW



The **ROCKFORD**
HYDRAULIC
Shaper Planer

THE outstanding feature of this machine, and one which perhaps renders it unique among machine tools is the fact that both table and feeds are operated by hydraulic power

Other interesting features are:

Increased work capacity.

Greater power, strength, and rigidity.

Finger-tip convenience of control.

Exact adjustment of speeds and feeds to work requirements.

Speedier operation.

Higher table-return ratio.

Simplicity.

Longer life.

Extreme accuracy—easily maintained.

Pressure lubrication of bearings by filtered oil.

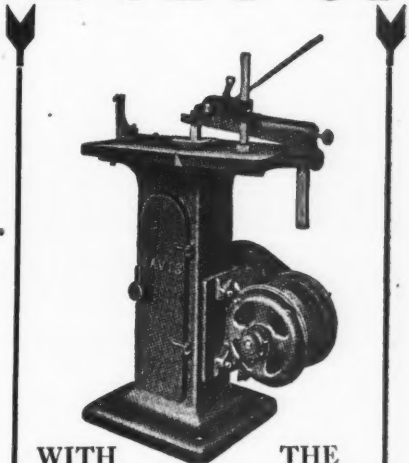
A new circular, already in its second printing, describes the features and numerous advantages of this machine and contains complete specifications. Write for a copy today.

**ROCKFORD MACHINE
TOOL COMPANY**

2414 Kishwaukee St.

ROCKFORD, ILLINOIS, U.S.A.

2 MINUTE SET-UP



WITH **THE**
Davis Keyseater

TWO MINUTES is all that is required to set up the Davis Keyseater. It is always ready for any job up to 1" wide in parts up to 12" high. It cuts straight or tapered keyways with equal efficiency.

Speed, operating convenience, and accurate results on production, short runs, or special work are profitable features which you cannot afford to overlook. Investigate these features today.

SEND COUPON NOW!

DAVIS KEYSEATER CO.
250 MILL STREET, ROCHESTER, N. Y.

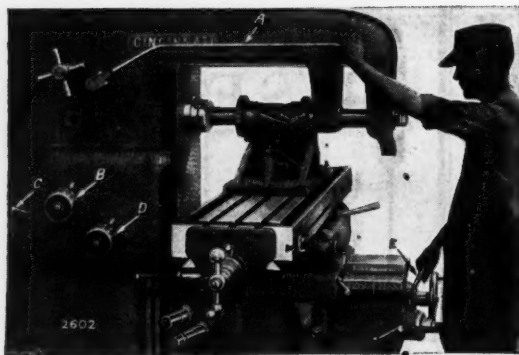
I am interested in the Davis Keyseater.
Send me Complete Catalog

Name.....Title.....

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M. M. S. 11



Spindle speeds and feeds are changed from the front by power. To change speed, the operator pulls outward on the starting lever and then shifts the lever at the front of the knee.

a cored passage in the saddle carrying it over to a pocket on the side of the knee and thence into the base.

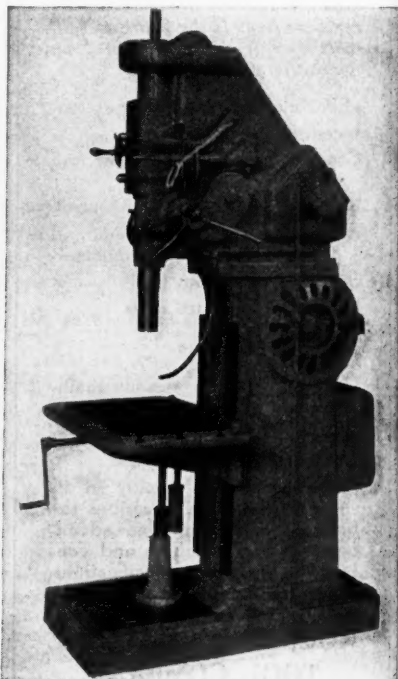
The leadscrew construction has been improved, the screw itself being larger in diameter with a longer bearing in the nut. The ends are mounted on a single mounting of roller bearings which take up both radial and end thrusts. Lubrication is provided by the one-shot system.

The table has a working surface and size overall of 15 x 62 1/2 inches with 3 1/4-inch "T" slots. The table of the No. 3 Universal swivels 45 degrees. The longitudinal range of all three types is 34 inches; the cross range of the plain and universal machine is 12 inches, and the vertical type, 16 inches. The vertical range on the plain type is 20 inches, the universal, 19 inches, and the vertical, 12 inches. The machine is operated by a 7 1/2 h.p. motor running at 1720 r.p.m. The floor space occupied by the plain and universal types is 106 x 113 inches, and by the vertical type, 90 5/8 x 113 inches.

Barnes No. 221 1/2 Production Self-Oiling All-Geared Drilling and Tapping Machine

The Barnes Drill Company, 840 Chestnut Avenue, Rockford, Ill., has augmented its line by the addition of the No. 221 1/2 Production Self-Oiling All-Geared Drilling and Tapping Machine shown in the illustration. The design

of this highly modernized machine provides sturdiness, ample power, and a high range of speeds and feeds for all work within a capacity of 1 1/2 inches in mild steel and within a swing of 22 inches. This machine is of the usual Barnes vertical type of construction, the eight quick change geared speeds being controlled by levers which extend to the front of the machine. There are also eight spur geared feeds which are controlled by quick change gears with accessible levers. The setting of the levers for speeds and feeds are clearly indicated on brass plates. The spindle and sleeve are made of "Nitalloy" steel, both surfaces being hardened after



Barnes No. 221 1/2 Production Self-Oiling All-Geared Drilling and Tapping Machine

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TUNGSTEN CARBIDE TOOLS

Hold No Terrors For

"NIELSEN" LIVE CENTERS



Users of Tungsten Carbide Tools have found that "Nielsen Live Centers" stand up under the gruelling high speeds necessary in the use of these tools.

Nielsen thoroughly tested centers have the required accuracy for all turning and grinding jobs, and are guaranteed against defects in material and workmanship.

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NIELSEN, INC.

LAWTON

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COOLANT PUMPS

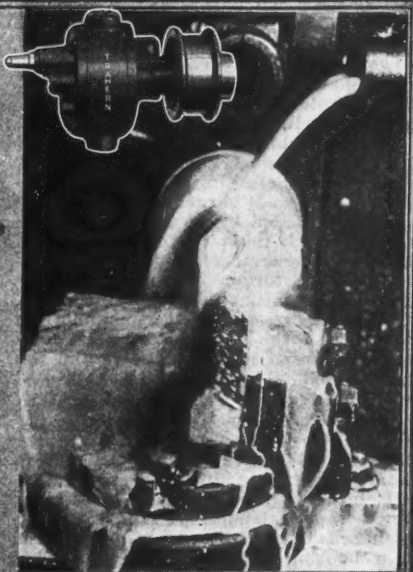
TRAHERN Coolant Pumps

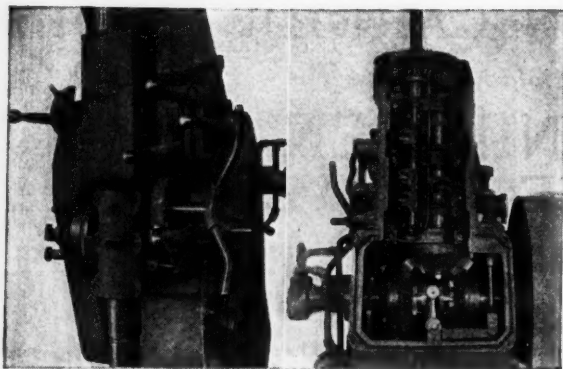
**Can Be Depended Upon for
Continuous Operation!**

TRAHERN Coolant Pumps are constructed to withstand hard usage, and are designed with only two moving parts which means continuous and efficient service throughout the life of the machine tools on which they are used.

Write for Catalog 54

**GEO. D. ROPER CORPORATION
ROCKFORD, ILLINOIS**





(Left)—Close front view of Barnes No. 221½ Production Drill showing feed and speed change levers and index plate. (Right)—Rear view of No. 221½ Production Drill with cover off to show spiral steel crown gears, chrome nickel heat treated quick change gears, and driving and reverse bevel gears with multiple disc clutch.

machining by the "Nitriding" process, giving an extremely hard case about $\frac{3}{16}$ -inch deep. This permits spindle to run on roller bearings which are self-oiling with rollers contacting directly upon the hardened surfaces of spindle and sleeve. No case or race way is used. Timken bearings are used for all speed change shafts and for the spiral crown gears. The drive shaft and hand wheel shaft operate in ball bearings and Rollway roller bearings are provided for the spindle thrust.

All speed change gears are cut from chrome nickel steel, heat treated. Crown gears are of forging steel cut with spiral teeth and hardened. The bearings are adjusted by means of threaded collars. Rack teeth are cut integral in the steel sleeve wholly within the circle, and the torque is taken by hardened collars on a cross spindle, the collars rolling in the milled channel at each end of the rack teeth. Six spline shafts are used in sliding gears and for the $\frac{1}{8}$ -inch main spindle.

The capacity of the machine is $\frac{3}{8}$ to $1\frac{1}{2}$ inch high speed drills in solid steel. The extreme height of the machine is 100 inches; swing, 22 inches; distance from column to center of table, $11\frac{1}{4}$ inches; maximum distance from No. 4 taper spindle to regular table, 31 inches. The sleeve is fully enclosed in a housing between the crown gear and sleeve bearings, thus permitting the

use of self-oiling roller bearings for the spindle in the sleeve. The sleeve housing is split, having Gunite cap with laminated shims for convenient takeup. The diameter of the spindle at the driving end is $1\frac{5}{8}$ inches; diameter of spindle nose, $2\frac{1}{8}$ inches; diameter of spindle sleeve, $3\frac{1}{4}$ inches. The vertical travel of the spindle is 14 inches; vertical travel of table, 23 inches. The ratio of back gears is 4 to 1. Size of drive pulley, 14×5 inches; speed of drive pulley, 400 r.p.m.; floor space, 47×24 inches; weight with coolant pump and motor drive, 2,700 pounds.

Bonney "C-V" Socket Wrenches

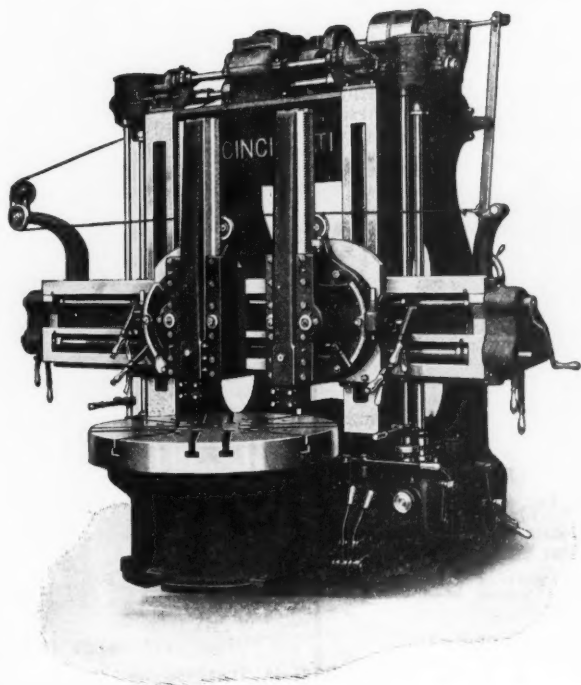
The well-known Bonney chrome vanadium wrench line, although unusually complete, has been further broadened by the addition of a line of double hexagon chrome vanadium sockets in a very complete range of sizes. Because of the great strength of the chrome vanadium alloy steel used by the Bonney Forge & Tool Works, it has been possible to design these wrenches with



Bonney "C-V" Socket Wrench

very thin walls, adding to their usefulness in close quarters. The wrenches are covered by the usual Bonney guarantee to replace, free of charge, any wrench that breaks in service. This firm is located at Allentown, Pa.

CINCINNATI BORING MILL



Rapid Power Traverse
Gravity Lubrication to Spindle and Track
All Steel Gears
Box Arch
Centralized Oiling

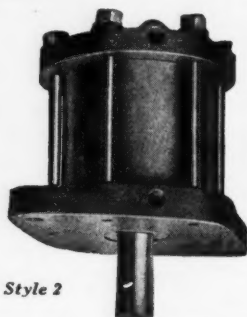
MADE IN SIZES 5 FT. TO 12 FT.

THE CINCINNATI PLANER CO.
3100 SOUTH STREET CINCINNATI, OHIO

"HOPKINS"
PREFERRED
EQUIPMENT

SAVE...

Time, Energy, Lost Motion in operating machine controls. These cylinders built in all required capacities for pneumatic operation. Consult our engineering department regarding the application of these efficient powerful cylinders to your machines.



Style 2

THE TOMKINS-JOHNSON CO.

620 MECHANIC STREET
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*Also Manufacturers of Chucks, Die
Sinking Milling Cutters, Work Stands,
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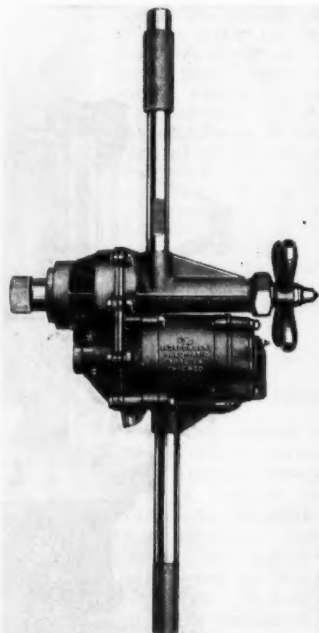
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Thor 275 Rotary Pneumatic Drill

A rotary pneumatic drill, known as the "Thor 275," has been placed on the market by the Independent Pneumatic



"Thor 275" Rotary Pneumatic Drill

Tool Co., 236 S. Jefferson St., Chicago, Ill. This tool is claimed to be an improvement over the piston-type pneumatic tools, due to the absence of inertia forces incidental to the operation of pistons, connecting rods, and so on. The governed free weight speed of the tool is 350 r.p.m., and the weight is 35 pounds. It has a drilling capacity of $1\frac{1}{2}$ inches and a reaming capacity of $1\frac{1}{8}$ inches.

The drill is of the "one-man" type. It operates smoothly and without vibration, one of its features consisting in that it carries a 50-pound load at the same speed that it operates at when free. A 100-pound load reduces the speed only 30 per cent, which is possible because of the governor which opens the

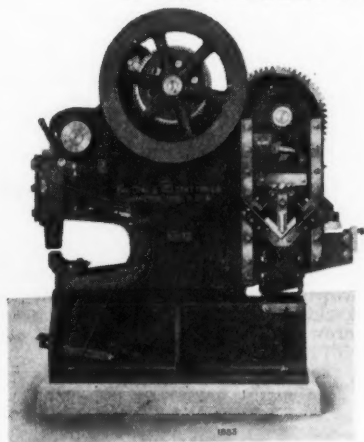
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STILL AT IT—

after more than fifty years, manufacturing

PUNCHING AND SHEARING



machinery for perforating and cutting metal in practically any size and shape—we offer a superior and more complete line than ever, including

**STEEL PRESS BRAKES
POWER PRESSES
ALLIGATOR SHEARS**
and sundry special machines.

**The
Long & Allstatter Co.**
HAMILTON, OHIO

AMERICAN V-2 Broaching Machine

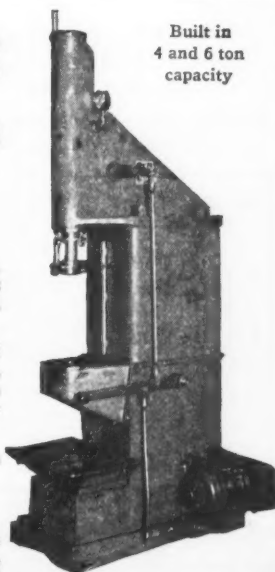
**SMOOTH - POWERFUL
ACCURATE - PRICED RIGHT**

HYDRAULIC PRESSURE is smooth acting, positive, and powerful—the ideal for accurate broaching. That is why the American V-2 Broaching Machine is equipped with hydraulic feed.

It gives the ram a steady, smooth, downward stroke, and at a speed of 20 feet per minute has enough reserve power, up to 6 tons, to complete the stroke at this speed. As soon as the stroke is completed the ram automatically returns to the starting position.

This feature and many others are completely described in our bulletin—write for it **TODAY!**

The American Broach & Machine Co.
ANN ARBOR MICHIGAN



Built in
4 and 6 ton
capacity

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Stuart Oils

FOR THE "TOUGHEST"
METAL WORKING CONDITIONS

AIRPLANE PARTS

Can be made with better finish and to closer limits—by the use of

Stuart's

Thred-Kut

(Pat'd Oct. 19, 1926)

Alloy Steel Cutting Oil

Your delay in trying this genuine development means a mutual loss.

New 64 page booklet (illustrated) mailed upon request.

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throttle as the load is increased. The governor reduces the speed to the minimum between holes, or when the drill is not operating under load, thus conserving air.

The construction of the drill is such that it can be used in close quarters without removing the dead handle. A special grade of cast iron with nickel is used in the cylinder to withstand wear from the rotor blade. Ball bearings are used throughout the tool, including the spindle and gear.

Brown & Sharpe Plug and Ring Gages

Two gages of the plug and ring type, which have been brought out by The Brown & Sharpe Mfg. Co., Providence, R. I., are shown in the illustrations herewith. The gages conform in design



B. & S. No. 664 Ring Gage

to the standards specified by the American Gage Design Committee, and are made of the highest grade of tool steel, especially selected for the requirements of the work. They are heat treated, hardened, ground, and lapped by processes which have been developed by long experience.

The plug gage No. 659 is furnished in "Go" and "Not Go" styles and either single or double-end handles may be obtained for use with this gage. The "Go" gage is easily distinguished from the "Not Go" gage by its longer measuring surface. This gage is furnished in any size or combination of sizes from .241 inch to 1.510 inch. All handles

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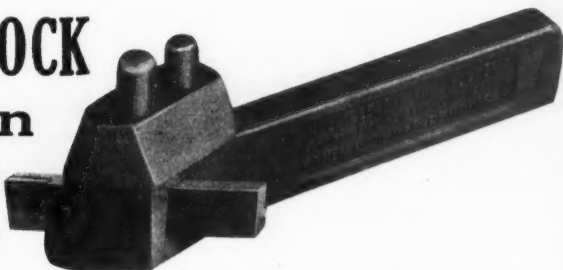
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WEDGE-LOCK Tungsten Carbide Tool Holder



THE rectangular slot tool holder is designed especially for holding Tungsten Carbide tools. In order to get good results from this cutting alloy, it is necessary that the Tungsten Carbide be rigidly supported by a shank of sufficient depth. This is possible in the rectangular slot tool holder. This holder is also particularly suited for handling Stellite bits or narrow blades for cutting off tools.

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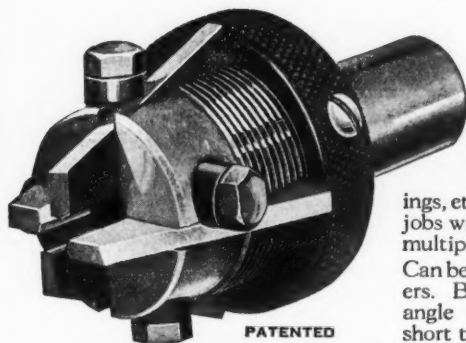
WEDGE-LOCK TOOL COMPANY

2521 NORTH KEELER AVENUE

CHICAGO, ILLINOIS

Genesee Adjustable Hollow Mill

Made in 7 different styles



PATENTED

Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

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GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK

are of hexagonal shape and finished in black.

The ring gage No. 664 is furnished in



B. & S. No. 659 Plug Gage

"Go" and "Not Go" style, in any size or combination of sizes from .241 to 1.510 inch. Rings up to .510 inch are of two-piece construction with a hardened, ground and lapped bushing inserted into a soft gage body. The larger rings are of solid stock, hardened, ground and lapped.

Wedge-Lock Multiple Bit Tool Holder

Users of tool holders will be interested in a new type of tool holder which has been placed on the market by the Wedge-Lock Tool Company, 549 West

Randolph Street, Chicago, Ill. The holder is known as a Multiple Bit Tool Holder, so-called because it will hold

any size of tool bit up to the maximum width or height of the slot. The holder is made in both right and left offset types, and with two types of tool slots; the regular square slot in sizes of $\frac{1}{4}$ -in. and up, and the rectangular slot in sizes of $\frac{1}{4} \times \frac{1}{2}$ -in. up.

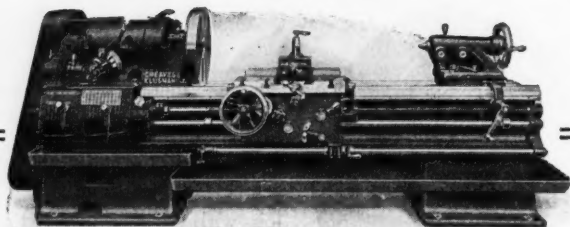
As the name implies, the tool bit is secured in the holder by a wedge locking device, one wedge operating to hold



Wedge-Lock Tool Holder

the tool and a reverse wedge serving to release the tool. When necessary to

Simplified Operation Through G-K SINGLE LEVER CONTROL



SIMPLIFIED OPERATION is the secret of economical lathe performance. Simplified Operation is the outstanding feature of G. K. Single Lever Control Lathes. Any speed of a wide range can be instantly selected through one lever, with an

index plate to show at a glance how to obtain the desired speed.

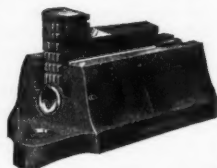
This, and many other G-K features, which appeal strongly to production men and plant managers, are all fully described in the G-K catalog. Send for your copy NOW!

The GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

SKINNER REVERSIBLE FACE PLATE JAWS



Half Nut Construction



Single Rib



Double Rib

SINGLE RIB

Fig. 91 Iron Body Fig. 93 Steel Body

Size Inches	Figure 91 List Price Per Set of Four Iron Body	Size Inches	Figure 93 List Price Per Set of Four Steel Body
4	\$ 59.00	4	\$ 83.00
6	80.00	6	112.00
8	96.00	8	139.00
10	128.00	10	187.00
12	160.00	12	227.00
14	214.00	14	320.00

BORING MILL JAWS

DOUBLE RIB

Fig. 92 Iron Body Fig. 94 Steel Body

Size Inches	Figure 92 List Price Per Set of Four Iron Body	Size Inches	Figure 94 List Price Per Set of Four Steel Body
6	\$ 96.00	6	\$160.00
8	118.00	8	208.00
10	155.00	10	267.00
12	198.00	12	336.00
14	254.00	14	427.00

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN. U.S.A.



Test It Out Yourself

NO obligation! Get one of these amazing Quick-As-Wink Couplings immediately on approval. Put it to work. Use it and abuse it. It swivels freely and won't leak. It will stand the hardest knocks and can be properly connected in only 30 seconds. Mud, snow or ice have no effect upon it.

One will be mailed to you to try out right on your own job. See for yourself how the use of Quick-As-Wink Couplings will lower maintenance cost, get four times as much service out of one coupling and will speed up work.

SEND TODAY!

C. B. HUNT & SON

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The Famous Tobin Bronze

Quick-As-Wink

HOSE COUPLING

For Any Hose Connection

One Operation Sets the Nut In Difficult Places

By hand
electric or
air tool

Shanks
made to
specifications

All parts
heat treated



UNIVERSAL JOINT NUT SETTERS

Let the tap follow the hole—
Better tapped
holes.

For single or multiple tapping.

Can be used in any position.

FLOATING TAP SLEEVES

Write for complete
catalog describing

CHUCKS—Quick change, positive and friction drive, floating, self aligning, UNIVERSAL JOINTS, NUT AND STUD SETTERS.

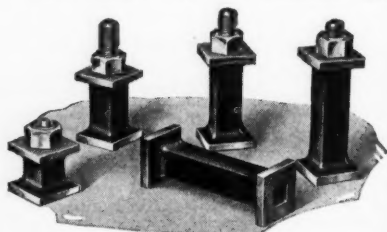
The APEX MACHINE CO.
305 DAVIS AVE. DAYTON, OHIO



change tool bits, it is only necessary to release the bit and withdraw it through the back of the holder, the new bit being inserted without moving the holder. The illustration shows that there are two round pins protruding from the top of the holder. A light blow on the top of the forward pin drives down a wedge that contacts with the tool and locks it in place. Tapping the rear pin loosens the wedge and releases the tool. The angle of the wedge is such that it affords ample clamping action to take care of the variation in sizes of tool bits and, as it is below the angle of friction, it cannot be jarred loose by vibration. The illustration shows a holder in which two small square tool bits are used, the lower one serving as a support for the upper or cutting tool, thus avoiding the use of a heavier and more expensive piece of tool steel.

Alliance Planer Jacks

Planer operators will welcome the line of planer jacks which has been placed on the market by the Alliance Tool



Alliance Planer Jacks

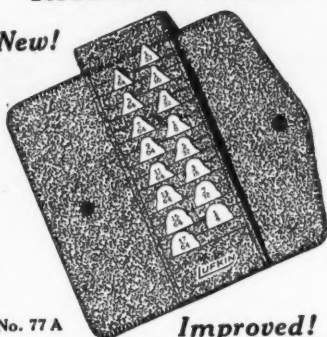
Company, Alliance, Ohio. The jacks, several of which are shown in the illustration, are made in five different sizes: 2, 3, 4, 5 and 6-inch, these several sizes being intended to take care of most jobs that come to the planer. The ends and edges of the jacks are finished by grinding.

Alliance Drill Press Vise

The drill press vise shown in the illustration has been brought out by the Alliance Tool Company, Alliance, Ohio. The outstanding feature of the vise is the rotatable jaw, which has four faces of different shapes for holding different kinds and shapes of work. Either of the four faces is instantly available,

LUFKIN RADIUS GAGE

New!



No. 77 A

Improved!

Sixteen Gages, each marked with radius. External and internal form on same gage. Assembled in neat folder.

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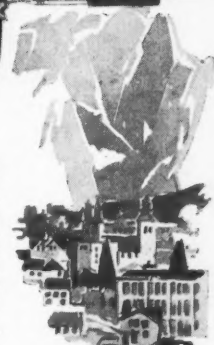
THE LUFKIN RULE CO.
SAGINAW, MICH.

PRECISION MEASURING INSTRUMENTS



Swedish Gage Micrometers, made by the makers of the world's most accurate measuring instruments, have hardened screws with ground and lapped threads—easily replaceable bronze nuts insure smooth operation.

Write for booklet describing the mike that is accurate within .000075".



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THE HOME OF ACCURACY

SWEDISH GAGE CO. OF AMERICA

7310 WOODWARD AVE., DETROIT, MICH.

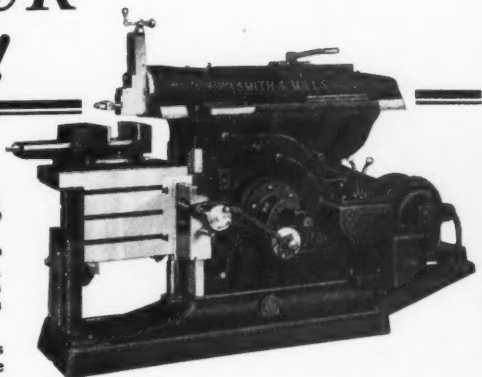
CUT YOUR COSTS!

SMITH & MILLS HIGH SPEED CRANK SHAPERS

are designed for accurate work at high speeds. They shorten production time, which cuts your operating costs. Smith & Mills shapers are equally efficient on tool room or production work.

Smith & Mills modern improvements include "V" type ram with 55 degree ways, splined shafts, heat-treated alloy steel gears, speed box shafts mounted on Timken tapered roller bearings, Twin Disc Clutch, and one shot lubrication system.

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Made in 16, 20, 25 and 32-inch sizes
back geared; single-geared in 12
and 14-inch stroke.

THE SMITH & MILLS CO., Cincinnati, Ohio

New Midget Type Electric Tools

Thor

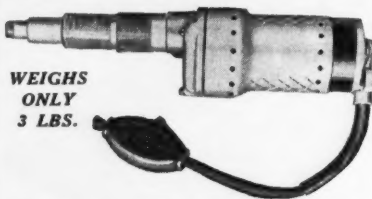
Electric Drills and Screw Drivers

These small tools were especially designed for fast, delicate work. They have rapidly taken the place of small hand operated tools because of their all-around practicability. Being small and light, they fit into the palm of the hand and are very easily handled.



**WEIGHS
ONLY
2¾ LBS.**

The Drills are made in two sizes—3/16 and 1/4 inch capacity. Weight is only 2¾ lbs. Length overall is 9¼ inches.



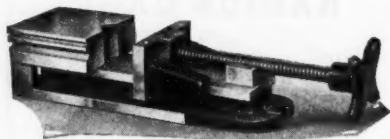
**WEIGHS
ONLY
3 LBS.**

The Screw Drivers are made in three types: one at 1250 R. P. M. for No. 8-32 metal screws; one at 950 R. P. M. for No. 10-24 metal screws; one at 485 R. P. M. for No. 8 wood screws. Weight is only 3 lbs. Length overall is 11¼ inches.

Try one of these small tools for ten days free of charge. If its performance doesn't satisfy, return at our expense. No obligation. Just write.

INDEPENDENT PNEUMATIC TOOL CO.
236 SO. JEFFERSON ST. CHICAGO

eliminating the necessity of trying to grip the work with such loose pieces as the operator may be able to find. The quick-acting screw is intended to save the operator's time, as it is only neces-

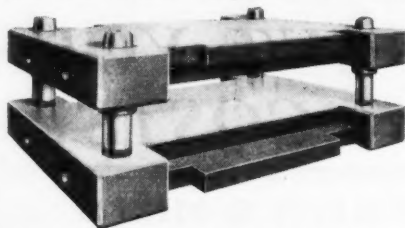


Alliance Quick-Acting Drill Press Vise

sary to lift the screw out of the half-nut, slide the jaw to the work, and give the screw a part turn to clamp the work securely. One end and two sides of the vise are machined square to enable the operator to use this tool in a number of different positions. The vise is made in three sizes, the largest opening to 6½ inches.

Danly Large Die Sets

The Danly Machine Specialties, Inc., has recently brought out a complete line of large die sets. These consist of 4-post and 2-post rectangular die sets,



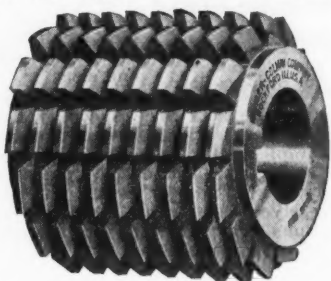
Danly 4-Post Rectangular Die Set Showing Hoisting Notches.

4-post square die sets, 2- and 3-post long-narrow die sets, together with heavy duty guide posts and bushings for these sets. Altogether there are five different types and eighty-five different sizes.

These large die sets have a number of unique and particularly interesting features. For example, both punch and die holder are equipped with notches so that slings or lifting chains cannot slip. All edges are bevelled. One pin of each set is ¼ inch off center, so as to prevent punch holder being inadvertently turned around. All sets are equipped with the well-known Danly removable guide posts, so that the die

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Is Our Motto

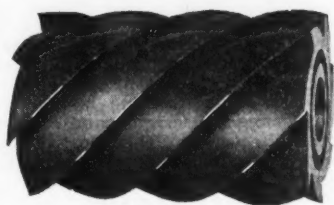
QUALITY
Our Creed



GEAR HOBS

and

"BETTER CUTTERS"



by

BARBER-
COLMAN

of

ROCKFORD

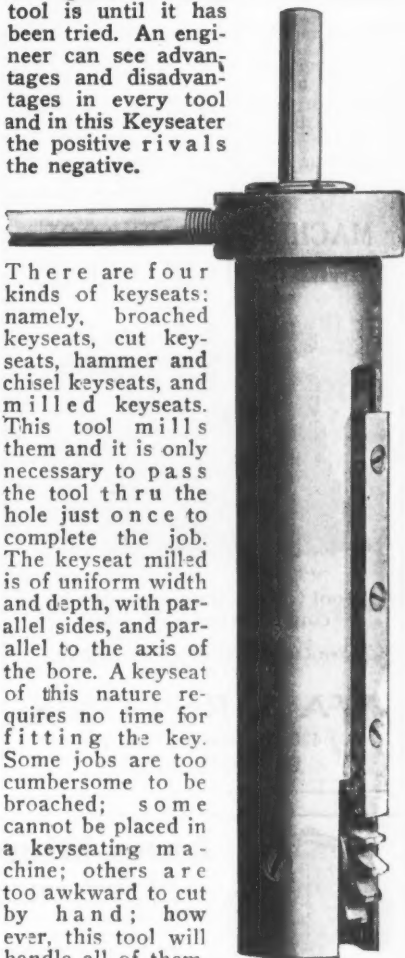
THESE Small Tools are built for long hours of steady use... to stand the battering of a heavy feed and emerge triumphant... to hew steadily to the limit line beneath a chattering mountain of chips... Quality to the core... strength and sturdiness ever dependable.

BARBER-COLMAN
COMPANY

General Offices and Plant—Rockford, Ill., U. S. A.

ONE NEVER KNOWS

how good or bad a tool is until it has been tried. An engineer can see advantages and disadvantages in every tool and in this Keyseater the positive rivals the negative.



There are four kinds of keyseats: namely, broached keyseats, cut keyseats, hammer and chisel keyseats, and milled keyseats. This tool mills them and it is only necessary to pass the tool thru the hole just once to complete the job. The keyseat milled is of uniform width and depth, with parallel sides, and parallel to the axis of the bore. A keyseat of this nature requires no time for fitting the key. Some jobs are too cumbersome to be broached; some cannot be placed in a keyseating machine; others are too awkward to cut by hand; however, this tool will handle all of them.

WRITE FOR CATALOG Q

National Machine Tool Co.

2271 Spring Grove Avenue

CINCINNATI, OHIO, U. S. A.

may be ground without removal from the die holder. The long-narrow die sets are equipped with bosses or pads



Danly Long-Narrow, 3-Post Die Set, Showing Bosses for Stripper Bolts.

for stripper bolts. The refinements and features are particularly useful, of course, for handling the die set, mounting the die, and for expediting the movement of these heavy sets as well as making for greater safety.

These new large die sets are standardized and are practically a continuation of this company's well-known "J" and "K" sets, which are carried in stock and are also available in fifty-eight different sizes.

These new types of Danly die sets are especially desirable for such work as automotive parts, farm implements, refrigerator cabinets, etc., hardware, electrical equipment and laminations; and for work employing progressive dies where two or more operations are performed at one operation of the press.

MACHINISTS AND TOOL-MAKERS TOOL CHESTS



Tool Chests that are right in construction and price.

Send for No. 25 Catalogue of Tool Chests and Tools.

WATERSTON'S

420 Woodward Avenue
DETROIT, MICH.

Excel Precision Filing and Sawing Machine

As the use of the power sawing and filing machine for the rapid cutting and finishing of all kinds of odd-shaped work is constantly increasing, the Index Machinery Corporation, 49 Central Avenue, Cincinnati, Ohio, has brought out a precision machine especially adapted for this work. This machine is of exceptionally rugged design, and is constructed to perform the most delicate sawing and filing operations with a maximum of accuracy.

The work is held on a table which can be adjusted to an angle of 15 degrees in any one of four directions, and the saw is operated by a smooth-running bow which is operated by double rams of large diameter, accurately ground. Universal adjustable clamps prevent lifting of the work. The movement of the bow is controlled by a foot lever through a smooth friction coupling, and the length of the stroke is adjusted by means of a hand wheel and graduated collar. Saw



Ames Micrometer Gauges

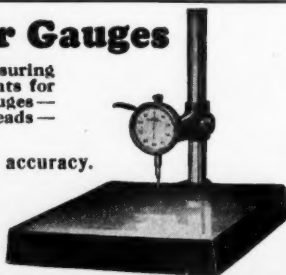
For almost every testing and measuring requirement—Precision Instruments for laboratory use—Upright Dial Gauges—Thickness Gauges—Dial Gauge Heads—Pocket Gauges—Comparators.

Precision with speed and extreme accuracy.

Send for complete information about them.

B. C. AMES CO., Waltham, Mass.

902 Stephenson Bldg., The Boulevard at Cass Ave., DETROIT, MICH.



The "CHAMPION" EXPANDING MANDREL

is the only Mandrel which completely and accurately fills the hole.

One set of "Champion" Expanding Mandrels—twelve of them—will fill by thousandths any inside diameter from $\frac{1}{2}$ " to $6\frac{1}{2}$ ".

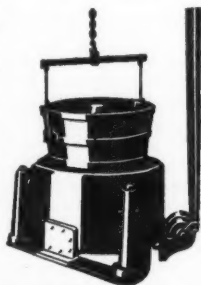
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Save the Oil From Long, Curly Turnings Too

The Tolhurst 40" and 48" Chip Wringers handle long, curly turnings just as readily as fine chips. These large capacity units, replacing small, one and two bushel machines, show very definite operating economies and in many cases do double or treble the work with one-half the labor.

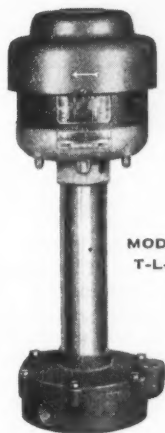
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TOLHURST MACHINE WORKS, Inc., Troy, N. Y.

New York Office: 30 Church Street
Chicago Office: 8 So. Dearborn St.

"GUSHER" Coolant Pumps



MODEL
T-L-O

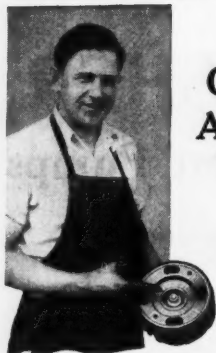
PERFECT HYDROSTATIC BALANCE!

Protects the bearings
from the evil effects of
the coolant—and
that means

Longer Life!

The Ruthman Machinery Co.

532 East Front Street
CINCINNATI, O.



New Cushion Abrasive Wheel

SPECIAL
BULLETIN
AWAITING
YOUR
REQUEST

HERE'S the greatest advancement in a single step that the buffing industry has ever achieved. With this amazing Quick-As-Wink Wheel all the disadvantages of rag-buffs are completely eliminated. It uses specially clipped strips of abrasive cloth of any grain, a change of which can be made in 30 seconds. Operates at a normal speed of 3,450 R. P. M., but is absolutely safe at over 6,000 R. P. M. Total width of buffing surface is constantly utilized. Wheel is unbreakable and strips will not burst. Wheel perfectly balanced, every operation safe, and all working parts guaranteed.

Cuts Buffing Costs 50%

Write for details of construction and complete information that show you how 50% of your buffing costs can be lopped off with this efficient, speedy tool. Send a sample of your work with your request for information if you so desire.

C. B. HUNT & SON

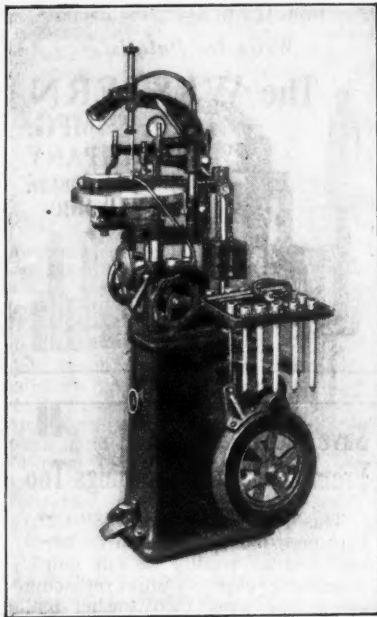
639 McKinley Ave. Salem, Ohio

Quick-As-Wink

BUFFING WHEEL

guides are provided both above and below the table.

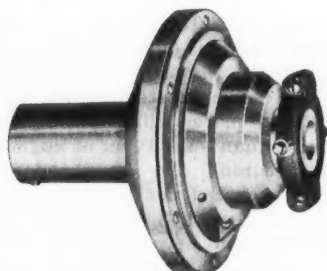
Files are held by the center, tension, or single-end method, the center files locating by a center in one end while the other end is fastened in a ring by four screws. All files with small cross sections are held in the bow under tension, thus increasing the resistance to bending. Single-end files are fastened at one



Excel Filing and Sawing Machine

end only in a two-jaw chuck on the bottom arm of the bow, and are used for delicate or finishing operations. The saws used may be of the usual straight, short-length types, or of the coil type for use in a magazine. All parts of the machine are standardized, all parts subjected to stresses are hardened and ground, and ball bearings are used throughout.

The maximum stroke is $4\frac{1}{4}$ in.; depth of gap, $8\frac{1}{4}$ in.; thickness of material admitted, $3\frac{1}{2}$ in. Diameter of table, 14 in. Total height of machine, 64 in. Strokes per min., 100-150-200. Size of base, 16 x 22 in. Power required, $\frac{1}{2}$ h. p.



Be Prepared

—With a Conway Disc Clutch in Stock

And when that old contrivance breaks down the next time—tying up an important machine or perhaps a whole department—treat it as you do any other piece of obsolete equipment—get it down out of there—and install

The Splendid Conway Disc Clutch—with its easy engagement, instant release, dragfree idling and power plus.

Our bulletin DC will give you the data. All you need know is the R. P. M., shaft diameter and horse power.

There is **only one** friction clutch—It is illustrated right here.

THE CONWAY CLUTCH CO.

1959 W. 6th St., Cincinnati, Ohio

"It is a splendid Clutch"

The PULLMORE Industrial Clutch



will do just what its name implies—pull a heavier load more efficiently! Some of the features which make this clutch so efficient are:

COMPACTNESS

which reduces the necessary clutch space to a minimum. Capacity as a basis, the PULLMORE is the smallest clutch made.

ADAPTABILITY

The small compact construction allows the clutch to be applied to practically every clutch requirement. It is built in six sizes (single or double) to operate dry, or in an oil bath.

SEND COUPON!

These features and many other efficiency features are described in the PULLMORE Catalog—send the coupon today for your copy!

Rockford Drilling Machinery Co.

10 Catherine Street
ROCKFORD ILLINOIS

ROCKFORD DRILLING MACHINE CO.

Rockford, Ill.

Send me a copy of the PULLMORE Industrial CLUTCH catalog.

Name Title.....

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MMS-11



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**In Stock ...
Immediate Delivery**

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

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**IT PAYS
TO BUY
THE BEST**

¼ H. P. Type M 5



Strand
VINTAGE SHOP

**FLEXIBLE
SHAFTS
AND
MACHINES**

For
Grinding
Polishing
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Rotary Filing
Drilling
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⅛ to 2 H. P.

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Manufactured by

N. A. STRAND & CO.
5001 North Lincoln St. CHICAGO, ILL.

Getting Cost Figures

(Continued from page 52)

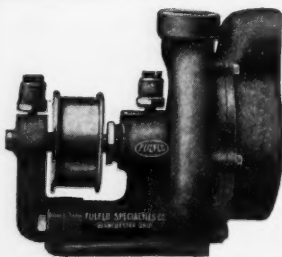
continue manufacturing. Whatever error there is is always on the safe side. If the material list is checked monthly, as suggested, errors due to change in prices will be eliminated. If more than one type of article is manufactured, the overhead item can be prorated per dollar of selling price as described previously. The foregoing can be applied in an exactly similar manner to any particular operation or division of the whole unit manufactured.

The greatest recommendation of the system described is its simplicity. Anyone can understand it and apply it readily and the shop men approve of it because it is practical and simple.

Saw Horse Saves Space

(Continued from page 62)

In the illustration, most of the objectionable features are eliminated. This horse is much more easily handled and can be stored in much less space. The legs are attached to the top cross member with heavy butt hinges which allow them to be folded together when the horse is not in use. When the horse is in use, the legs are locked in the correct position by means of two heavy steel hooks, fastened between the legs at either end as shown.



CONSTANT SERVICE PUMPS

A CONSTANT, full flow of coolant, non-clog construction, design that eliminates wear on the pumping part! Fulflo Pump features insure pump service that enables the grinding wheels to do efficient work under the best wet grinding conditions.

Cut shows the Fulflo Belt Driven Grinder Pump, capacity 35 gallons at 1,800 R. P. M. Also made in other sizes and capacities. Send for details of Fulflo Belt and Motor Driven Pumps.

FULFLO SPECIALTIES CO., Blanchester, O.

TOOL SALVAGING MEANS 20% TO 60% SAVING!

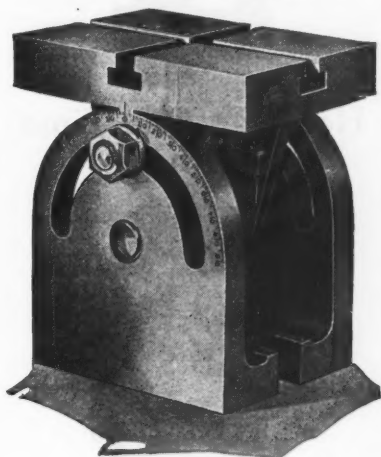
Don't throw away your old worn-out cutters! Have them recut by the National Tool method and save from 20% to 60% on your tool costs.

The teeth are recut and the clearance restored by this method without impairing the quality or temper of the steel. *Each recut tool is guaranteed to be as efficient as a new tool.*

You can prove the merit of the National Tool method to your own satisfaction. Just send us a trial order and test the reclaimed cutter in your own shop! We'll pay the transportation one way.



ALLIANCE Adjustable Angle PLATES



will save time in any tool room in checking, laying out work, or performing light machine operations.

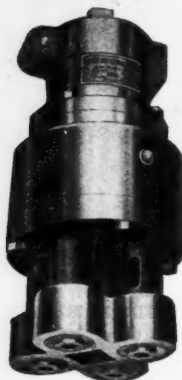
The 180 degrees of adjustment enables the work to be presented at any point within this range, without releasing the clamping. The 8x12 size is provided with two key slots in the base at right angles. This is very convenient when the work to be done is on a milling machine where it is desirable to use only the one T slot for clamping. The tables are provided as shown with T slots for clamping the work. Built in two sizes. *Write for details.*

Table Size	Height	List Price
4 x 6	6 1/2"	\$ 60.00
8 x 12	9 1/2"	120.00

ALLIANCE TOOL CO.
ALLIANCE, OHIO

4

Holes At One Time
With a



U. S. DRILL HEAD

THE U. S. Drill Head changes your one-hole-at-a-time drilling machine into a multiple drill, by allowing any number of holes—fifty if necessary—to be drilled in the same time as one hole.

The particular head shown drills four holes at one time, but we make drill heads to drill any number of holes to meet your requirements.

Send us blue print of your job, and we will show you what you can save by using a U. S. Drill Head.

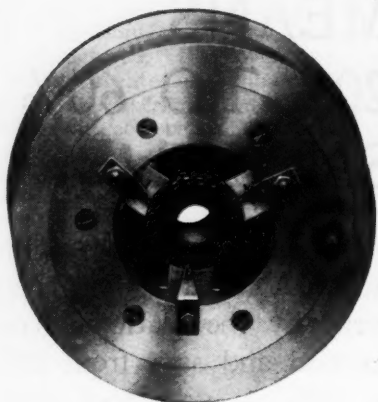
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Ohio, U. S. A.

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Is the time-proven investment in gear chuck satisfaction. The patented construction against wear insures an almost indefinite life with only the minor maintenance costs of grinding jaws and replacing pins.

The chuck is so designed that it can be quickly loaded from the front without using adapters, and holds the gear so that the bore is ground concentric with the pitch line of the teeth.

The Bolender chuck is made in two sizes—number 1 for 20 tooth 6-8 pitch and number 2 for 31 tooth to 20 tooth 6-8 pitch for either power or hand operation.

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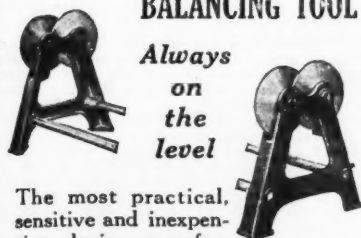
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level*

The most practical, sensitive and inexpensive device manufactured for balancing pulleys, cones, armatures, fly wheels, polishing wheels, etc. Will set anywhere and is easily portable. In sizes up to 24,000 pounds capacity.

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Sundstrand Machine Tool Co.
ROCKFORD, ILL.

DETROIT SEMI-AUTOMATIC DRILLING MACHINE

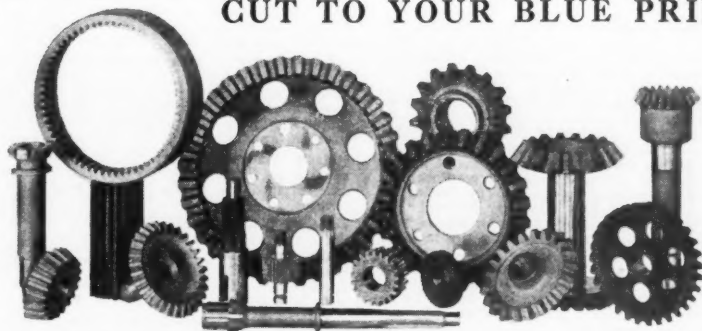
This efficient production machine will drill the work as fast as the operator can load the fixtures. A pull of the lever locks or unlocks the fixtures instantly. Capacity No. 60 to $\frac{3}{8}$ " drills. If you are looking for speed, accuracy, simplicity and low cost operation, try the DETROIT.



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circular.*

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For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Abrasive Grinding Wheels: The types of wheels, with recommended grades and grains, which should be used for each of the various kinds of grinds are discussed in a booklet which will be sent free to mechanical executives by the Abrasive Company, Philadelphia, Pa.

Labor-Saving Machine Shop Tools: A complete line of machine shop accessories such as adjustable angle plates, drill press vises, V-blocks, box and ribbed parallels, planer jacks, and so on are described in a bulletin which can be obtained by addressing the Alliance Tool Co., Alliance, Ohio.

Broaching By Modern Methods: Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Anglo Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, spines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-feeding, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 637-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

How to Sharpen Cutters: A series of leaflets, which describe and illustrate the correct methods to employ in sharpening all kinds of cutters, can be obtained, without charge, by addressing Brown & Sharpe Mfg. Co., Providence, R. I.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Cundy-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Gears of All Kinds are described and illustrated, with specifications, in Catalog 80 which has been issued by the Chicago Stock Gear Works, 105-9 S. Jefferson St., Chicago, Ill. Copy sent free on request.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

Giant Automatics with Hydromatic Feed is the title of a book that describes in detail the new type of automatic milling machine with hydraulic feed, which has been developed by The Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio. Copy free to any machine shop executive upon request.

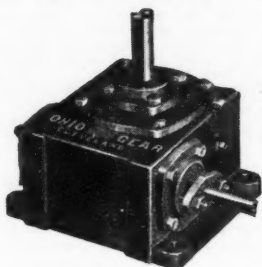
Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Modern Shaper Design: The trend of modern machine tool design as applied to shapers is discussed in a new booklet which has been published by The Cincinnati Shaper Co., Cincinnati, Ohio. The booklet also describes and illustrates the various types of shapers made by this firm. Copy free upon request.

Bolender Gear Burnisher: The latest methods of burnishing gears for accuracy and silence are described in a booklet that has been issued by the City Machine & Tool Works, 5 N. June St., Dayton, Ohio. Copy free upon request.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

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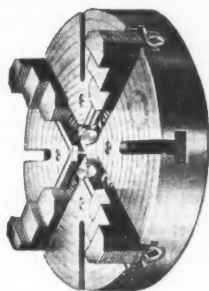
displace the present slow and wasteful method of driving studs. It fits snugly over the threads of the stud and you can drive the stud as tight as necessary.

Send for one on fifteen days trial. You'll find it as necessary as a wrench.

No. Size of Shank	Diameter of Stud	Price Less Disc.
No. 1	0"- $\frac{3}{8}$ "	\$ 7.00
No. 2	$\frac{7}{16}$ "- $\frac{1}{2}$ "	8.50
No. 3	$\frac{11}{16}$ "- $\frac{15}{16}$ "	10.00
No. 4	1"- $\frac{1}{4}$ "	14.00

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The best lathe cannot achieve the combined degree of production and accuracy demanded of it without an efficient chuck—and the right Union Chuck (there's one for every size and class of work) will go far toward insuring the service you require.

Improvements on the Union Chuck shown are characteristic and important. Eighteen inch and larger have double creasing on the bites, which gives 25 per cent more gripping power—reduces the effort required to chuck castings, forgings and other heavy parts; extra large chrome nickel heat treated screws, extra large jaws and heavier construction throughout add further to the efficiency and long life of Union Chucks.

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Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio, describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Disc, Expansion and Compression Clutches: The various types of clutches and their uses are discussed in an illustrated booklet that is issued by The Conway Clutch Co., 1959 West Sixth Street, Cincinnati, Ohio.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Dandy Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Quantity Drilling: A semi-automatic multiple spindle drilling machine which is designed to produce the maximum of drilled holes in medium or small parts, is described in a pamphlet that is published by the Detroit Machine Tool Co., 5055 Woodward Ave., Detroit, Michigan. Sent free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Interchangeable Counterbore Co., 7410 St. Aubin St., Detroit, Michigan, describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

Silent, Self-Lubricating Gears for use in all kinds of machines are described in a booklet that can be had upon application to Fibroc Insulation Company, Valparaiso, Indiana.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

"Non-Clog" Coolant Pumps are described and illustrated in a booklet which has been issued by the Fulflo Specialties Co., Blanchester, Ohio. Copy free upon request.

Quick-Acting Clamp: A bulletin describing the "Rapid" drop-forged steel clamp manufactured by the Fountain Equipment & Mfg. Co., 2025 Elm St., Cincinnati, Ohio, has been issued by this firm.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Galmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Grinding, Polishing and Buffing Machines of the latest types are described and illustrated in a series of bulletins that have been issued by the Hammond Machinery Builders, Kalamazoo, Mich. Copies free upon request.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

"Quick-As-Wink" Buffing Wheels that eliminate all disadvantages of rag-buffs, speed output, do better work, and cut buffing costs to the minimum are described in a bulletin that is issued free by C. B. Hunt & Son, 639 McKinley Ave., Salem, Ohio.

"Do It Electrically": The complete line of "Thor" universal electric tools, including tools for drilling, reaming, screw-driving, tapping, nut-setting, grinding, and for performing other operations is described in Catalog No. 17, issued free by the Independent Pneumatic Tool Co., 236 S. Jefferson St., Chicago, Ill.

"Excel" Precision Filing and Sawing Machine: A filing and sawing machine for use in producing templates, dies and other irregular-shaped parts is described and illustrated in a booklet which is issued free by the Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio.

Special Miti-Waukee-Mills of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Cutter and Tool Grinding: A book that tells how to grind tools and cutters accurately and which also describes and illustrates the different types of Leikland Universal Tool Room Grinders will be sent free upon request. Address, The R. K. Leikland Machine Tool Co., Cincinnati, Ohio.

Lathe Dogs and C Clamps are described and illustrated in Catalog No. 80, issued by the W. G. LeCount Tool Works, South Norwalk, Conn. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Operations: A complete line of machines for perforating and cutting metal in practically any size and shape is described and illustrated in a booklet which has been issued by The Long & Allstatter Co., Hamilton, Ohio. Copy free upon request.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Internal Grinding: The latest methods of grinding internal surfaces with speed and precision are described and illustrated in literature issued by the Micro Grinder Company, Bettendorf, Iowa, builders of Micro Grinders. Copies free upon request.

Hi-Production Counterbores: A counterbore of simple yet highly efficient construction, with positive drive, rigidity, and a number of other features is described in a circular which will be sent free upon request. Address Morse Counterbores & Tool Co., 12281 Turner Ave., Detroit, Mich.

Monarch Stud Drivers: A stud driver that will set a stud tightly and then release easily is described in a circular that will be sent free upon request to Monarch Tool & Mfg. Co., 2704 E. Larned St., Detroit, Mich.



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To adjust—pull the trigger, set the ram up to the work, and give the screw one turn to obtain necessary pressure. Clamp designed to withstand hardest usage. Made in

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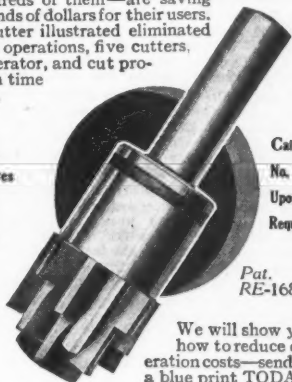
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—hundreds of them—are saving thousands of dollars for their users. The cutter illustrated eliminated several operations, five cutters, one operator, and cut production time in half.

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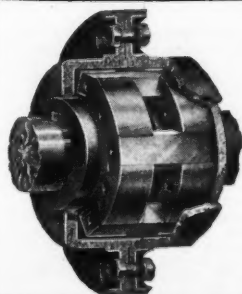
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are recommended for motor driven equipment—guaranteed to stand up on the most severe drives. All steel—heat treated and lubricated.

Write for Bulletin 329

W. H. NICHOLSON & CO.

136 Oregon Street

WILKES-BARRE, PA.

Automatic Tapping and Threading Tools of the latest types and designs are illustrated and described in Catalog No. 25, which has been issued by the Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich. Copy free upon request.

Natco Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

Double Your Cutter Service: Milling cutters, reamers, and other tools can be recut at a saving of from 20 to 60 per cent by the National Tool Salvage Co., 3840 Beaubien St., Detroit, Mich. Circular upon request.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

Grinding Wheel Information: A booklet which tells how grinding wheels are made and graded, and which give instructions for mounting wheels, operating speeds for different kinds of work, instructions for truing and dressing, and other information has been issued by the Norton Company, Worcester, Mass. Sent free upon request.

Correct Cutter and Tool Grinding: Grinder booklet "E" illustrated with 48 photographs reveals the secret of correct and economical tool grinding. It shows how cutter costs can be reduced and more production per grind of cutter obtained. Published by The Oesterlein Machine Company, 3319 Colerain Ave., Cincinnati, O.

Speed Reducers: Speed Reducers to obtain any desired reduction up to 24,000 to 1 are described and illustrated in Catalog 29-A, issued by The Ohio Gear Co., 1335 East 179th St., Cleveland, O. Copy free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1450 Maumee Street, Adrian, Mich. Mailed upon request.

Self-Tapping Sheet Metal Screws: Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St., New York City, N. Y. Sent free upon request.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Proconier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Proconier tools play in obtaining greater accuracy and less tap breakage.

Pallmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is

illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Universal Openside Shaper-Planer: The need of a machine tool to fill the gap between the shaper and the planer has been filled by the development of the Rockford Universal Openside Shaper-Planer, made by the Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill. Full description on request.

Complete Pump Information: The Geo. D. Roper Corporation, Rockford, Ill., has compiled a catalog which is arranged so that the prospective user of a pump can immediately determine the size and model of pump that is best suited to his need. Copy free upon request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Safety Grinding Wheels: The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-Em-Up" drill sleeves, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Equipment For the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

"Metal Cutting" is the title of the book that describes the latest methods of cutting metals, and includes descriptions and illustrations of both the band saws and inserted-tooth metal-cutting saws made by the Simonds Saws & Steel Co., Fitchburg, Mass. Copy will be sent free upon application to the firm mentioned.

"Chucks and Their Uses" is the name of a book which contains a full description of the different kinds of chucks and suggestions for the proper care of chucks, and tells how chucks should be fitted to lathes. It also contains a number of suggestions for general shop practice. Sent free upon application by The Skinner Chuck Co., New Britain, Conn.

Shaping with Modern Equipment: The Smith & Mills Company, 2889-91 Spring Grove Avenue, Cincinnati, Ohio, has issued a booklet which describes and illustrates the line of modern shaping equipment made by this firm. Copy free upon request.

Cutting Oil Data: A series of booklets containing valuable information about cutting oils and their uses for thread-cutting, broaching, and general cutting purposes will be sent free to any mechanical executive by D. A. Stuart & Co., 2727 South Troy St., Chicago, Illinois.

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Flexible Shaft Equipment: The uses of the flexible shaft for drilling, grinding, and other operations is discussed in a booklet which also describes and illustrates the flexible shaft equipment made by N. A. Strand & Co., 5001 N. Lincoln St., Chicago, Ill.

Rigidmill Principles and Practice: A book that shows how the Rigidmill can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

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**Balanced Reverse
Fool-proof Safety Friction
Positive Tap Holder
All Hardened Gears**

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With the "Procunier" Safety Friction Device blind holes can be tapped just as easily as through holes, and without danger of breakage.

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**Electric Steel
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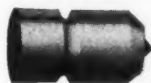
Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four chilled iron discs rotate on ball bearings

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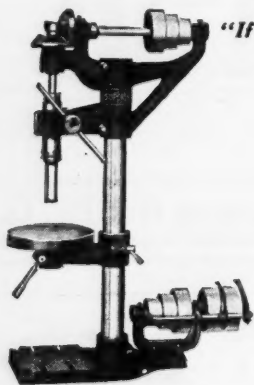
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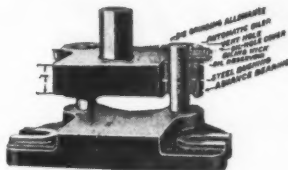


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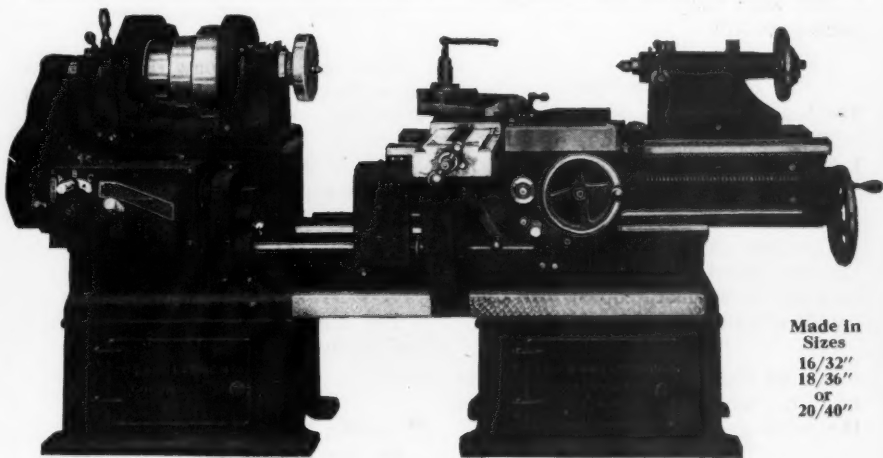
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THE SCRAP PILE

By GEO. ALEXANDER MANN



Mother Goose—Up-to-Date

Mary shed her stocking,
She felt so nice and cool;
It made the children laugh and play,
To see the calf at school.

Mos' o' the statesmen in Washington
seem to have the idea that the best
way to make the country dry is to
drink it dry.

Paw says daughter dresses like she
cooks—to kill.

'Twas Ever Thus

The laundry pack I open,
They've pulled the same ol' stunt—
I find they've sent my shirt back,
But they still have the front.

The best gag we've heard lately is
the one about the golfer condemned
to hang whose last request was for a
couple o' trial swings.

It's all right for a woman to hang
on to her man—jes' so she don't abuse
the privilege while he's driving.

Absoloote

The ones who are the victors,
At bridge played by the dames,
Are those who win the arguments.
An' not who win the games—

The strain on our fronts is what's
said behind our backs.

Some men look that way 'cause
they been married a long time an'
others are jes' naturally round
shouldered.

A Reg'lar Routine

With ev'ry bran new son-in-law,
Comes home a lot o' sorrow—
Dad sets 'em up in biz today,
An' buys 'em out tomorrow.

Maw says when paw drinks like a
horse he sleeps like a horse—with his
shoes on.

Good Use Fer Ut

"Here's sumpin to stop knockin'
It'll cure it up for life"
Bill said, "My car don't need it,
But I'll feed it to my wife."

The man about town is usually a
fool about wimmin.

Poor Liz

He spoke with heaving bosom,
In true movie fashion;
What was really asthma,
Lizzie thought was passion.

The bone o' contention in business
is the jaw-bone o' the ass.